THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

VOL. XXII. No. 541.] LONDON, JUNE 17, 1873. [25TH YEAR.] Price 1s.

RAMSAY'S NEWCASTLE CANNEL

COAL. Analysis—10,000 cubic feet of gas per ton of coal; 26-candle gas; 13¼ cwt. coke per ton of coal.

RAMSAY'S PATENT CONDENSED COKE.

DO. GARESFIELD COKE.

RAMSAY'S FIRE-CLAY ARTICLES.

GAS-RETORTS, introduced 1838. FIRE-BRICK WORKS, established 1804. FIRE-CLAY SANITARY PIPES, CHIMNEY-TOPS, and all Goods made of Fire-Clay. The Fire-Clay is worked from Blaydon Main Colliery, is of excellent quality, and no expense spared in perfecting every article. The FIRE-BRICKS (marked "RAMSAY") are to be seen in all parts of the world, and the Works are the most extensive in the Kingdom.

Manufactories—Derwenthaugh, Swalwell, and Hebburn Quay, near Newcastle-on-Tyne; and London Wharves—Falcon Wharf, No. 80, Bankside; and Honduras Wharf, Cubit Town. Large stocks kept.

Address G. H. RAMSAY, NEWCASTLE-ON-TYNE.

GEORGE GLOVER & CO.,

Patentees of the Standard Gasometers for the Government, and of the

IMPROVED DRY GAS-METERS.

These Meters are warranted to measure correctly and not to vary. Their acknowledged superiority has brought them into general use more rapidly than any Meters hitherto manufactured.

To meet the increasing demand, G. GLOVER AND CO. have just entered on possession of extensive premises adjoining their present Works in Ranelagh Road, and they are now prepared to execute promptly, orders to any extent. They keep in stock all sizes of Meters up to 200 lights. In cases of haste, on the receipt of a telegram early on one day, their Meters can be delivered next day in any part of England, and in the large towns in Scotland.

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236, GEORGE STREET, GLASGOW;

OR

15, MARKET STREET, MANCHESTER.

COWEN'S PATENT FIRE-CLAY RETORTS.

JOSEPH COWEN and CO.,

BLAYDON BURN, NEAR NEWCASTLE-ON-TYNE,

Were the only parties to whom a PRIZE MEDAL was awarded at the GREAT EXHIBITION of 1851, for "GAS-RETORTS and OTHER OBJECTS in FIRE-CLAY," and they have also been awarded in the INTERNATIONAL EXHIBITION of 1862, the PRIZE MEDAL for "GAS-RETORTS, FIRE-BRICKS, &c., for EXCELLENCE of QUALITY."

J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts in the United Kingdom; and orders for Fire-Clay Retorts of all shapes and dimensions, Fire-Bricks, and every other article in Fire-Clay, are promptly executed at their Works as above.

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Coal Office,

QUAY SIDE, NEWCASTLE-ON-TYNE.

JOHN RUSSELL AND CO.,

THE OLD TUBE-WORKS, WEDNESBURY

AND

THE ALMA WORKS, WALSALL.

Established at the commencement of Gas Lighting.

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16, SOHO SQUARE, } LONDON

35, 36, 37, & 39, GRANBY ROW, MANCHESTER.

J. R. and Co. are the original manufacturers of Wrought-Iron Gas Tubes and Fittings, and Inventors of the LAP-WELDED TUBES for Locomotive and Marine Boilers.

J. R. and Co. make all kinds of Tubes and Fittings for Gas, Steam, and Water; Gun-Metal Cocks, Stocks, and Dies; Galvanized Tubes and High-Pressure Tubes, &c.

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STREET-LAMP

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ESTABLISHED 1830.

All materials found for the alteration of Public Lamps for lighting with the Rod. Regulators with Lava Burners.

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NEAR NEWCASTLE-ON-TYNE.

WILLIAM COCHRAN CARR begs most respectfully to thank the Metropolitan, Provincial, and Continental Gas Companies for their patronage for several years past, and to intimate that he has rebuilt and enlarged his extensive premises for the manufacture of CLAY RETORTS; and that he is now prepared to execute the largest orders with punctuality and despatch. Orders for FIRE-CLAY RETORTS, of all shapes and sizes, FIRE-BRICKS, and all other articles in Fire-Clay, executed on the shortest notice, and on the most reasonable terms.

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J. & W. ROMANS, Consulting Gas Engineers and Coal Factors, of Edinburgh and London, CONTRACT for supplying any quantity of COAL and CANNEL.

They are also Contractors for leasing Gas-Works, for supplying, erecting, or repairing gas apparatus and fire-clay goods.

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(INVENTED & PATENTED IN 1844,)

COMBINING ALL THE LATEST IMPROVEMENTS,

MANUFACTURED ONLY BY

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MEDAL AWARDED, EXHIBITION, 1862, "FOR GOOD WORK."

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FOR GAS, STEAM, AND WATER;

Also ORDINARY WELDED WROUGHT-IRON TUBES and FITTINGS,

FOR GAS, STEAM, & WATER, EITHER BLACK, GALVANIZED, OR ENAMELLED.

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LAP-WELDED IRON & HOMOGENEOUS METAL TUBES

For Locomotive, Marine, and Stationary Boilers.

Boiler-Tube Ferrules, Gun-Metal Gland Cocks, Water-Gauges, Whistles, &c.; Stocks, Taps, and Dies for Screwing, and Gas-Fitters Tools of all kinds.

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THE UNVARYING WATER-LINE GAS-METERS,

IMPROVED DRY GAS-METERS, in Cast-Iron or Tin-Plate Cases;

STATION-METERS, ALL SIZES, up to 15 feet Square, with PLANED JOINTS;

Experimental Meters, Photometers, Pressure-Gauges,

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The only Prize Medal awarded for TUBES & FITTINGS.

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PURIFIERS, CONDENSERS, SCRUBBERS, RETORTS, VALVES;

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AND GAS APPARATUS OF EVERY DESCRIPTION.

SOLE MANUFACTURERS OF LIVESEY'S PATENT GASHOLDER MAN-LID,

By use of which Man-lid, inlet and outlet pipes can be examined and cleansed without loss of gas in crown of holder, or ingress of atmospheric air.

ROOFS, GIRDERS, BRIDGES, AND BOILERS OF ALL KINDS.

Drawings, Specifications, and Estimates supplied on application.

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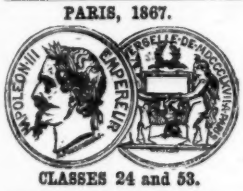
PARIS, 1867.



CLASSES 24 and 53.

WILLIAM SUGG,

GAS ENGINEER.

LONDON, 1862.

CLASSES 13 and 31.

PUBLIC LAMP GOVERNORS, LEVER COCKS, AND POLE LIGHTERS

LAMP METERS AND BOXES,

IMPROVED LOWE'S JET PHOTOMETERS.

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1862.

PATENT ANTIMONY PAINT.

MADE ONLY BY

GEORGE HALLETT & CO.,

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CLASS II.

This Paint having been in general use over eleven years (especially in some of the principal Gas-Works), and proved itself the best light-coloured Paint produced for resisting the influence of vitiated atmospheres, it is important that its qualities should be more widely known.

It is not discoloured like white lead in a sulphuretted atmosphere, nor washed off like white zinc; and its light colour reflecting heat, produces much less expansion of gas in holders painted with it than with dark colours, besides rendering them much more sightly. Its specific gravity is so much below white lead that the same weight will cover one-third more surface, while it is equal in body; and its price being about the same (30s. per cwt.), it is actually one-third cheaper. From experience, its manufacture is greatly improved, and it is quite suitable for all purposes in which white lead is employed.

Reference is kindly permitted by the Engineers of the City of London, Commercial, London, and Surrey Consumers Gas Companies, who pronounce it the best Paint known for their purposes.

N.B.—Antimony Paint, COVERING SO MUCH MORE WORK, costs about 20s. per cwt., as compared with White Lead at 30s. per cwt.; a similar economy arises from its use in Steam and Gas Joints, for which purpose it is superior to White Lead.

TO ENGINEERS, GAS COMPANIES, RAILWAY COMPANIES, &c.

THE TORBAY PAINT COMPANY,

SOLE PROPRIETORS OF

GOVERNMENT PATRONAGE, ADMIRALTY & WAR OFFICE.

CALLEY'S GENUINE "TORBAY" PAINT

AND

THE ANTI-GALVANIC PAINT.

THESE PAINTS ARE SPECIALLY PREPARED, and are most valuable for protecting and arresting rust on all ironwork, AND WILL COVER TAR EFFECTUALLY; they adhere strongly, acquire great solidity, do not crack, flake off, or blister by heat, and they resist the effects of SULPHUROUS AND GASEOUS EXHALATIONS.

They are used extensively at a large number of GAS-WORKS, on Gasholders, Purifiers, and all classes of Ironwork; also by Government, Railway Companies, &c.

Our CIRCULAR will be forwarded on application. SAMPLE CAN, for trial, sent free of charge.

Works: Brixham, Torbay, Devon,

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THE FARNLEY IRON COMPANY, LIMITED,

FARNLEY, near LEEDS,

MANUFACTURERS OF

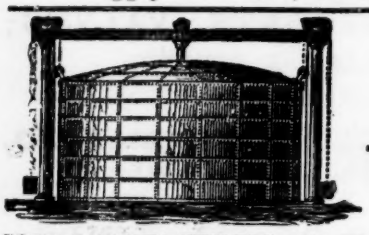
FIRE-CLAY GAS-RETORTS & FIRE-BRICKS,

Of every size and shape, and of the best quality; also of White and Coloured GLAZED BRICKS, SANITARY PIPES, &c., &c.

The F. I. Co. have the exclusive right to make and sell Fraser's Patent "Ribbed" Gas-Retorts in Fire-Clay.

In order to meet the constantly increasing demand for their Gas-Retorts, the F. I. Co. have recently made such an addition to their premises as will enable them to execute expeditiously the largest home or foreign orders.

Apply as above, or to the London Offices, 15, NEW BROAD STREET, E.C.



IMPROVED GAS APPARATUS,

FOR CITIES, TOWNS, VILLAGES, &c.,

INVENTED AND MANUFACTURED BY

W. C. HOLMES & CO.,

WHITESTONE IRON-WORKS, HUDDERSFIELD.

SOLE MANUFACTURERS of B. W. THURSTON'S IMPROVED SCRUBBER, CONDENSER, and WASHER, in use in many of the principal Gas-Works on the Continent.

PATENTEES of the IMPROVED COMBINED PURIFYING APPARATUS, so eminently adapted for Exportation.

ESTIMATES, PLANS, and SPECIFICATIONS PREPARED for BUILDINGS and APPARATUS.

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*** *Please address letters to Huddersfield.*

REFERENCES TO UPWARDS OF 300 GAS-WORKS.

DANIEL HOWARD,

Successor to the late BENJAMIN WHITEHOUSE,

(ESTABLISHED IN 1765,)

BOILER AND GASHOLDER WORKS,

Westbromwich, near Birmingham.

MANUFACTURER OF TELESCOPE AND SINGLE GASHOLDERS,

WROUGHT & CAST IRON TANKS

FOR DITTO,

PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS,

And all kinds of GAS APPARATUS.

Wrought-Iron Roofs, Bridges, and Girders; Steam, Hot Water, and Range Boilers; Tanks, Cisterns, &c.,

And all kinds of Wrought-Iron Work.

DRAWINGS, SPECIFICATIONS, and ESTIMATES FURNISHED.

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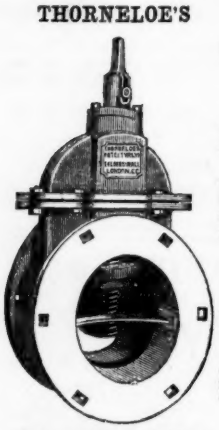

PATENT VALVE.

THORNELOE & COCHRAN,

GAS ENGINEERS AND CONTRACTORS,

SOLE MAKERS OF

CHANDLER AND SON'S

PATENT REGULATING DIP-PIPE.

Copy Testimonial.—A series of experiments have taken place at the Erith Gas-Works with "Chandler's Patent Dip-Pipe," which was found to prevent any deposit of carbon taking place at the back or on the surface of the clay retorts; there was also considerable increase of gas per ton of coal carbonized, whilst the apparatus continues working with the greatest simplicity and certainty.

Prospectus, with Price Lists and Particulars, on Application.

THORNELOE'S PATENT VALVE

For GAS and WATER, from 3 to 24 inches,

SUPPLIED FROM STOCK.

They are now in use at the following Gas-Works in London:—PHŒNIX and SOUTH METROPOLITAN; also at Aylesbury, Aldershot, Colchester, Farnham, Guildford, Leicester, Ilford, Middlesboro' Patent Gas Company, Reading, &c.

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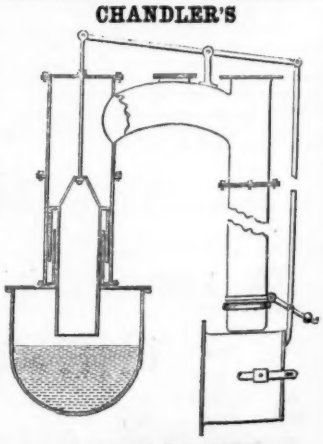
CHANDLER'S



PATENT DIP-PIPE.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

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Brookfield Works,

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MANUFACTURER OF

WOOD GRIDS

FOR PURIFIERS AND SCRUBBERS,

AND

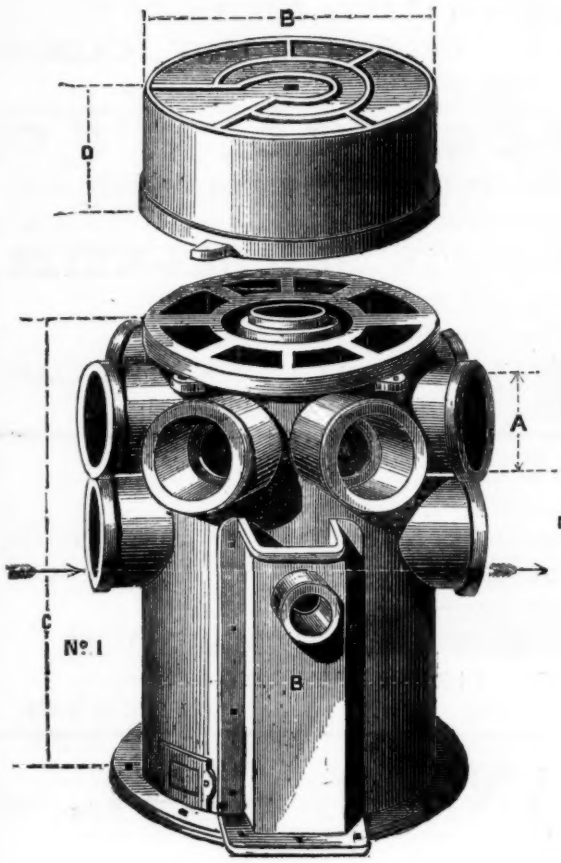
CONTRACTOR FOR GAS APPARATUS & MAIN-LAYING.

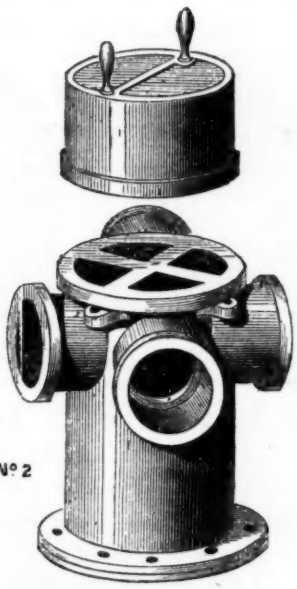
THE THORNCLIFFE IMPROVED CENTRE-VALVE,

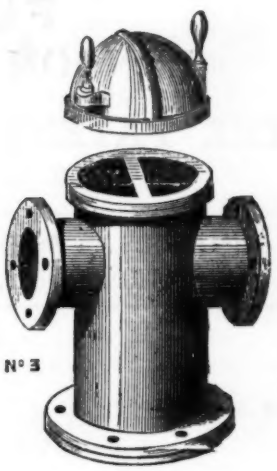
MANUFACTURED BY

MESSRS. NEWTON, CHAMBERS, & CO.,

THORNCLIFFE IRON-WORKS, NEAR SHEFFIELD.







Sizes of the

THORNCLIFFE IMPROVED CENTRE-VALVE.

		Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
A	Bore of Pipe...	4	5	6	7	8	9	10	12
B	Diam. of Body.	16	20	23	26	28	31	34	40
C	Height of Tank.	33	35	38	43	46	48	51	56
D	Depth of Cover.	8	9	10	11	12	13	14	16
	Total height...	41	44	48	54	58	61	65	72

THORNCLIFFE IMPROVED BYE-PASS VALVE.

SIZES

From 3 ins. upwards.

THORNCLIFFE IMPROVED STOP-VALVE.

SIZES

From 3 ins. upwards.

In all cases the Covers are cast heavy enough to resist any required pressure.

The advantages derived from the adoption of these Valves are so manifest and cardinal that in the immediate character of the change—the simplicity of the machine—the facility affording for cleaning out connexions between Valve and Purifier—the perfect collection and delivery by suitable overflow of the ammonia, at a greatly diminished depth from ground-line over the old form of Valve—the advantage of connecting on the same level, and at any angle, or opposite to each other, the inlet and outlet pipes without dip or rise—the clear acquisition of space in the purifying-house, by being able to place the boxes nearer together, the new Valve being entirely under the floor—and lastly, though of the greatest importance, the passage of crude and unpurified gas during the change is minimized to the merest fraction, thus preventing the fouling by impure gas the delicate machinery and easily affected exposed movements of the station-meter, thereby preventing the introduction of the enemy (unpurified gas) into the gasholder. Also a dead abutment is offered to all back pressure, imparting thereby to the gauges, governors, and hydraulic seals, a steadiness of action never realized with the once famous, but now fast becoming obsolete, Hydraulic Centre-Valve.

N., C., and Co. also Manufacture and Erect

PURIFIERS, CONDENSERS, SCRUBBERS, GASHOLDERS, ROOFS,

And every description of Gas Machinery.

TENDERS GIVEN FOR WORK FIXED COMPLETE IN ANY PART OF THE KINGDOM.

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GARRATT STREET WORKS, OLDHAM ROAD, MANCHESTER;

Manufacturers of

IMPROVED CONSUMERS WET GAS-METERS

IN CAST-IRON CASES,

THE UNVARYING WATER-LINE GAS-METER,

AND

IMPROVED DRY GAS-METERS;

STATION-METERS OF ALL SIZES, with PLANED JOINTS;

GOVERNORS, PRESSURE AND EXHAUST REGISTERS, TEST HOLDERS,

And all kinds of Experimental Gas Apparatus.

FULLERTON, SON, & CO.,

LONDON ROAD METER-WORKS, EDINBURGH,

SOLE MANUFACTURERS OF

THE PATENT IMPROVED TIN-PLATE DRY GAS-METER,

WITH SPECIAL FACILITIES FOR ADJUSTMENT AND REPAIR,

The principal parts of the mechanism being accessible by the removal of a single Screw.

GAS-METERS on the WET and DRY principles made in CAST-IRON and TIN-PLATE CASES.

STATION-METERS, GOVERNORS, EXPERIMENTAL & TEST METERS, GAS APPARATUS, &c.

JOHN HALL & CO.

STOURBRIDGE,

MANUFACTURERS of FIRE-BRICKS, LUMPS, & TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.

N.B.—A Stock of 15 and 16 in. CIRCULAR RETORTS always on hand. Other kinds made to order on short Notice.

DUKINFIELD CANNEL COAL.

THE DUNKIRK COAL COMPANY.

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JOSEPH CLIFF & SON,

THE ORIGINAL

WORTLEY FIRE-BRICK WORKS,

NEAR LEEDS,

MANUFACTURERS OF ALL DESCRIPTIONS OF

FIRE GOODS, and Salt-Glazed Drain-Pipes.

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Wharf No. 4, inside Great Northern Goods Station, King's Cross, N.;

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Where is always kept a Stock of Retorts, Fire-Bricks, Terra Cotta Ware, and Drain-Pipes.

TANGYE BROTHERS & HOLMAN,

10, LAURENCE POUNTNEY LANE, LONDON, E.C.,

SOLE MAKERS OF

MORTON'S PATENT SELF-SEALING RETORT-LIDS,

WITH

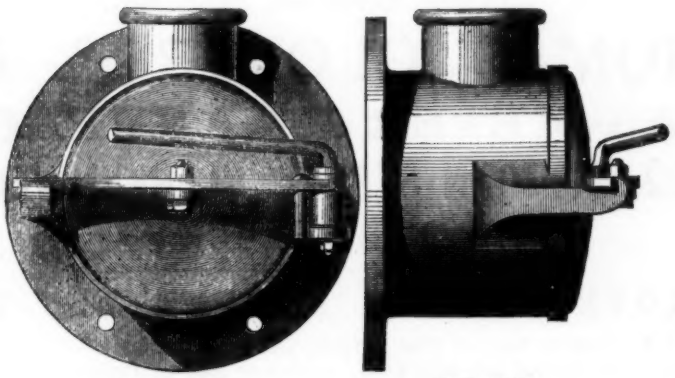
HOLMAN'S PATENT ECCENTRIC FASTENINGS.

OVER 7000 IN USE.

NO LUTING.

LIDS HINGED TO MOUTHPIECES; NO LIFTING ON OR OFF.

NO SCREWS FOR FASTENING.



FRONT VIEW. SIDE VIEW.

SIMPLE.

ECONOMICAL.

DURABLE

EFFECTIVE.

NO DUPLICATE LIDS REQUIRED.

These Lids are proved by many eminent Gas Engineers to be the most efficient, saving much time, labour, and expense; are opened and closed as quickly and with as little trouble as an ordinary furnace door, and by their use the Retorts are soundly sealed during the whole period of carbonization.

THESE LIDS ARE IN USE AT THE FOLLOWING (AMONG MANY OTHER) GAS-WORKS:—

The Gaslight Company, Beckton (where over 2000 are in use).
„ Gaslight Company, Bow Common.
„ London Gaslight Company.
„ Independent Gaslight Company.
„ Phœnix Gaslight Company.
„ South Metropolitan Gaslight Company.
„ West Ham Gas Company.

The Gas-Works, Royal Arsenal, Woolwich.
„ Alliance and Dublin Gas-Works.
„ Edinburgh Gas-Works.
„ Manchester Corporation Gas-Works.
„ Salford Corporation Gas-Works.
„ Rochdale Corporation Gas-Works.
„ Liverpool United Gas-Works.
„ Birkenhead Gas-Works.

The Nottingham Gas-Works.
„ Newcastle-on-Tyne Gas-Works.
„ Carmarthen Gas-Works.
„ Merthyr Tydfil Gas-Works.
„ Ystrad Gas-Works.
„ St. Alban's Gas-Works.
„ Over Darwen Gas-Works.
„ Aylesbury Gas-Works.

The Morton's Lid is made circular in form, that being the most convenient and suitable shape. It can be used for Retorts of any section, by adapting the Mouthpiece casting from the D, oval, or other shape, at the back, to circular in front.

The following important Testimonial, among others, has been given:—

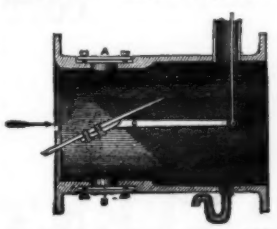
The Gaslight and Coke Company. Engineer's Office, 6, Westminster Chambers, Nov. 14, 1871.

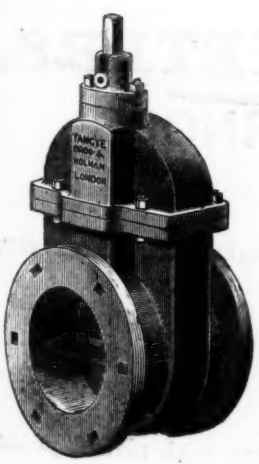
Dear Sir,—In reply to your inquiry, I have the pleasure of stating that the whole of the Mouthpieces at Beckton have Morton's Lids attached to them, and they have given us every satisfaction. We have 2160 in use.—I remain, yours truly, (Signed) F. J. Evans.

SOLE MAKERS OF

HUNT'S PATENT EQUILIBRIUM GAS-GOVERNOR.

In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communication being avoided by placing the Lever or Radius Arm (shown at C on the drawing) inside the Valve-Chamber, upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.





London Gas-Works, Nine Elms, Dec. 25, 1871.

Gentlemen,—The 18-inch Hunt's Patent Throttle-Valve Governor supplied by you to this Company has been in use for about six months, working very satisfactorily; it obviates entirely the oscillation which sometimes occurs with the ordinary Governors, with the annoyance and danger arising therefrom. The efficiency of this Instrument, together with its compactness and lowness of price, ought to ensure its general adoption.

Messrs. Tangye Brothers and Holman. (Signed) Robert Morton, *Engineer.*

TANGYE BROTHERS AND HOLMAN

Have in Stock, and ready for immediate delivery, the following GAS-VALVES:—

20 3-inch Rack Valves.	9 6-inch Screw Valves.	13 10-inch Screw Valves.
7 4 „ Screw Valves.	14 8 „ „	12 12 „ „
10 5 „ „	10 9 „ „	14 14 „ „

CLELAND'S PATENT DIRECT STEAM-JET EXHAUSTERS.

TRAVELLERS AND HYDRAULIC LIFTS FOR PURIFIER-LIDS, &c.

London 1851. New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865.

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

Paris, 1867.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN,

LONDON, E.C.

THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS,

1st, Are a remedy for all the defects of Wet Meters;
2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

WILLIAM PARKINSON & CO.,

(SUCCESSORS TO SAMUEL CROSLEY,)

COTTAGE LANE, CITY ROAD, LONDON, E.C.

Established 1816.

MANUFACTURERS OF

PATENT WET & DRY METERS,

STATION-METERS AND GOVERNORS,

PRESSURE REGISTERS, GAUGES,

EXPERIMENTAL METERS, PHOTOMETERS, GASHOLDERS, &c., &c.

WATER METERS.

W. P. & Co. beg to state that they are now prepared to supply Station-Meters with planed joints.

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JUNE 17, 1873.

Notes upon Passing Events.

If the Alexandra Palace had been the property of the Government, instead of a joint-stock company, or if the Alexandra Palace had been under the care of dignitaries of the Church, instead of shrewd men of business and practical builders, what a howl of indignation would have run through the length and breadth of the land. A Government dockyard burned under the same circumstances, no matter whether the First Lord was a Liberal or a Conservative, would have afforded texts for the opposition press for at least twelve months. The story is as old as the art of laying lead on a roof. Four plumbers—the most careless class of mechanics that exist—are sent up to the top of a timber edifice as dry as tinder to do a small repair. They take with them the ordinary dangerous fire tripod of their trade. No one thinks any extra precaution necessary. They work, they rest, take their dinners, go to sleep, and wake to find the wooden dome on fire. A good deal has been said about the want of water. The fact is the company, or the congeries of companies of which the Park and Palace finances are composed, have had quite enough to do with their money in getting the concern into working and paying order, without laying out dead capital in extra mains, and hydrants, and steam fire-engines for the improbable contingency of a fire. According to the most authentic reports, unless the careless plumbers could at once have turned a tap and flooded the commencing fire, no quantity of water pumped through the fire-engines that came galloping to the spot could have been of the smallest use. The result will be, for a short time, extraordinary watchfulness on the part of the guardians of public buildings, and then the usual forgetfulness, the usual defective hose, rusty hydrants, buckets not to be found, and ladders chained fast with locks of which no one present has the key. Such is human nature—such is the regular habit of "locking the door when the steed is stolen." Unless the fire guardians of a great building are periodically disciplined and constantly on the alert, when the fire comes they will surely be unprepared.

In this very dull season for news, when racing and the visit of the Shah are the only topics that excite a languid interest, the dispute between Earl Fitzwilliam and his colliers is quite an important contribution to newspaper topics. Earl Fitzwilliam is in a peculiar position, it seems. His coal mines afford him a surplus income. He has no dividends to pay to impatient shareholders; and he is not dependent for his own comforts or luxuries on the produce of his coal pits. He has not a whole city expecting its gaslight from him, and he is not like a farmer, who, if he does not reap his crops when ripe, will never get them at all, and if he does not sow his seed in season will have no crops to reap. In this peculiar and independent position, when his men or some of his men attempt to bully him into discharging a man that suits him but does not please them, he can safely turn round and say, "Go if you like; for my part, I can close "my pits—coal unhewed will not fall in value—and wait until you "come to reason;" thus acting on the maxim that "everything "comes to the man who can afford to wait." But this very exceptional case proves nothing. Sooner or later the law of supply and demand will settle all the labour questions, for no coercion can induce producers to go on producing at a loss, and no contrivance will ever keep wages down in the face of a real demand for work.

The farmers are certainly having a very hard time of it, because their calling does not afford room for those "hits" by which a manufacturer sometimes recoups himself for past losses. Long has the agricultural labourer been a helpless, obedient, ignorant serf on his hands. The only bright light beyond the vista of strikes and astounding wages is to be found in the fact that the same man cannot be allowed to strike in harvest or in seed time and become an able-bodied pauper in winter. The high wage movement will be a blessed thing, not for the agricultural interest only but for the kingdom, if the rural labouring population imbibe the idea that they must live on their savings, and that it is not absolutely a matter of course that the squire, the parson, the parson's wife, or the farmer, is bound to provide for them, not only when sickness overtakes them, but on every birth and death, and every winter as far as coals and blankets are concerned. In Cobbett's time the fear was lest rural England should be devoured by poor-rates—by relief paid in getting men to dig holes and fill them up again. In these days the rise of wages devouring profits makes the farmer sigh for the good (?) old times of able-bodied paupers and poor-law relief in aid of wages.

We do not know yet whether this is going to be a dry or a wet summer, but however the season may turn out the time is appropriate for referring to a very interesting paper on the storeage of water, read last month before the Farmers London Club by Mr. Bailey Denton, a paper full of facts and useful suggestions, not so extravagant in any of its speculations as might have been expected from a man riding his favourite hobby. Indeed, as long as Mr. Denton sticks to the agricultural questions, which he thoroughly understands, he is an unusually safe guide. It is rather surprising to learn, considering how much has been written of the effect of agricultural drainage on water supply, that out of 10 millions of acres of retentive soil, only 3 millions have been so prepared for the best results of agriculture. Mr. Denton advocated the storeage of water in seasons of rainfall and flood for various purposes; for the daily consumption of villages not sufficiently populous to bear the cost of regularly constituted water-works; for the supply of steam cultivators and for giving motive power to implements for the preparation of cattle food or other agricultural machinery; and for the use of live stock in droughty seasons. He also suggested its use for manufacturing purposes; but this was a matter rather out of his beat, and only introduced to give additional importance to a question really important only in an agricultural point. Manufacturers do not need extraneous agitation when they see a prospect of investing capital to advantage. No prejudice will prevent them from using a steam-engine if it will pay, or from substituting water power for steam power if it will pay better. The following extracts give a good idea of the demands and the supply of rainfall which we might store for regular and exceptional demands:

Every inch of rain falling on an acre of space supplies 22,622 gallons of water. Multiply this number of gallons by 32, the number of inches representing the average rainfall, and the total obtained by the number of acres forming the area of England and Wales, we arrive at 27,019,632 millions of gallons as the quantity of water which on an average of years falls on the surface at the feet of the population, exclusive of the deposition of dew, which forms no very small or unimportant item in the water economy of the country. The quantity of water actually consumed at present varies from as little as two gallons per head per diem in villages and isolated places where the water used is obtained by personal labour, to from 30 to 50 gallons per head per diem in some of our cities and towns where public supplies exist. The average quantity used throughout England and Wales for all purposes is probably not much more than 15 gallons per head, though it may be well to allow that before the next 20 years have passed the increasing demand for water for all purposes will raise this quantity to a mean of 25 gallons. If the population of England and Wales, which reaches 25 millions, is multiplied by 25, it will amount to 625 millions of gallons per diem, or 228,125 millions per annum. To this requirement of the population we must add that which is wanted by animals and farm stock scattered throughout the country, and which are not provided for in the water supply of towns. The number of horses, cattle, sheep, pigs, and dogs does not much exceed 50 millions, and if each animal uses and wastes 5 gallons per diem, the total result will be 250 millions of gallons per diem, or considerably less than half the quantity required by the population. This quantity has to be supplemented by the water consumed in the production of steam used in manufacture as well as that which is used at the homestead or in the field. This, however, if we allow that steam power to the extent of from 10,000 to 12,000 horse power per annum is added to the power used in agriculture alone, cannot bring the whole to more than 1000 millions of gallons per diem, or 365,000 millions per annum, which is only a 74th part of the rainfall with which Providence blesses us on the average of years.

Turning to the question of supply, we find that—

In the six months forming the winter half of the year, from October to March inclusive, floods are more frequent in proportion to the rainfall than in summer,

in consequence of the absence, or dormant condition, of vegetation, and the reduced extent of evaporation, and owing to the fact that the soil itself is frequently in a wet condition. During this period a considerable proportion of the rain which has entered and saturated the permeable soils descends into the earth to do its work of replenishment. In the six months forming the summer half of the year, from April to September inclusive, on the other hand, floods are comparatively few, though they are injurious when they occur, and the quantity of rain penetrating the earth beyond a depth of three feet is very small. Indeed, the water-bearing strata generally receive no appreciable replenishment during summer; they are nearly wholly dependent for their replenishment on the supersaturation of winter. In some of the extremely open beds, it is true, such as the chalk, the new red sandstone, and the Bagshot sand, the infiltration of the rainfall is rapid, and a heavy rainfall will serve to raise the water level even in summer, and set the lower springs running, but this is the exception, and not the rule. In fact, the storeage of water in the earth does not accumulate until the winter rains have produced supersaturation. In a well that I have carefully watched this past wet winter, I found the water stood on the 1st of January last at exactly the same height as on the 1st of the preceding July; while from the beginning of the present year to the first of the present month (May), the water has gradually risen and now stands 7 feet 10 inches higher than it did on the 1st of January last. A wet summer has very little effect in increasing the subterranean supply, but it has the advantage of restoring the water upheld by attraction, and thereby of lessening the demand on the water stored beneath, which would otherwise rise and lower the level of its bed. When great rainfalls occur in summer, that proportion which is not absorbed passes into the rivers to swell and increase their volume without any apparent corresponding advantage beyond raising for a time their perennial flow.

What Mr. Denton recommends is the storeage of the surplus or waste water, and he computes that 15 inches may be stored with advantage. Underdrainage does not diminish the water supply, because—

Inasmuch as water cannot run out of the drains until the subsoil is filled with water up to the level of the drains, and the soil between the drains and surface is in a state of supersaturation. When, in winter, this condition has been reached, a large proportion of the rainfall is discharged from the underdrains within 24 hours of its reaching the surface, if the surface soil be properly cultivated and rendered absorbent. In the summer there is little or no discharge from the underdrains of clay lands, though in many instances a never-ceasing and copious discharge is obtained from the draining of surcharged free soils. There is no doubt that with extension of underdrainage an improvement of our rivers and watercourses has necessarily been effected, and that the water from the underdrains, when discharged, as well as that which overflows the surface, are carried down into the valleys with greater rapidity than before. The result is a considerable increase in the aggregate, though, for the most part, the quantity obtained is due to the winter's discharge and not to that of the summer.

In dry seasons the labouring population of rural villages have frequently to pay for every pail of water they consume at the rate of something like £2 per 1000 gallons, while the inhabitants of towns get all they require at from 6d. to 2s. per 1000 gallons. Properly constructed underground tanks are infinitely to be preferred to stagnant pools and ponds. The extended use of concrete has very much cheapened the construction of underground tanks:

No dwelling or set of buildings, of which the roofs are slate or tile, should be without its tank, unless the occupants are otherwise abundantly supplied. There are few places in England, and certainly none in Wales, in which 20 inches of rain may not be collected with certainty, even in the driest year. Taking an ordinary middle-class house in a village, with stabling and outbuildings, the space of ground covered by the roofs will frequently reach 10 poles; while the space covered by a farm labourer's cottage and outbuilding will be 2½ poles. Assuming that the roof is slate, and the water dripping from it is properly caught by eave-troughing and conducted by down-pipes and impervious drain-pipes into a water-tight tank, sufficiently capacious to prevent overflow under any circumstances, and that by this method 20 inches of water from rain and dew is collected in the course of the year, the private houses will have the command of 28,280 gallons, and the cottage 7070 gallons in a year. To make it clear that this quantity of water can generally be obtained, it should be stated that the proportion lost by evaporation, &c., from a slate covering will not exceed one-sixth of the total quantity of rainfall with the deposition of dew added. The supply of water to villages, however, should not be dependent upon individual action altogether, for the occupiers themselves are powerless, and cottage owners as a rule are not very liberally disposed in the provision of this necessary of life. There should be some public supply, to render villages independent of their landlords. Where there is a stream of *pure* water near at hand, or where there is a subterranean water-bed easily reached by sinking wells down to it, it is needless to think of storeage, but so long as there are a large number of small communities with rating values so low as to negative the power to charge any large outlay upon them, it behoves us to consider with the utmost care any plan which will enable us to secure a sufficient supply of pure water at a cheap cost. In villages it is unnecessary to aim at the supply of from 20 to 25 gallons a head. Two gallons of water per head per diem is as much as is at present consumed in the majority of villages, and 10 gallons are quite ample. To supply 10 gallons a head should not be a difficult matter; though in cases where there is no land that has been artificially underdrained near at hand allowing of the underdrainage water being utilized, or where there is no other means of collecting surface water, it may be absolutely necessary to combine several villages, and by a properly devised system provide for the whole. Much may be done by insisting that cottage owners should provide each cottage such a tank as I have spoken of, or the share of a tank with other tenants, and, by the addition of a common tank to hold a month's supply for the whole village, the object might be secured at a fair cost. In the chalk districts good water-tight tanks may be made of concrete, and I am informed that you may make capital concrete of chalk itself and Portland cement. Under propitious circumstances surface waters may be collected in winter, for summer use in open reservoirs, but they should not be less than 7½ feet deep in the clear to supply 400 people at 10 gallons a head. The water may be delivered in the village street from these reservoirs at from 20s. to 25s. per person, including purchase of land for the reservoir, iron pipes, stand pipes, and taps. Assuming that the money required be borrowed and paid off in 30 years by instalments, not exceeding in amount 5 per cent. on the outlay, the result would be a charge of about 1s. or 1s. 3d. per person per annum.

On clay-land farms Mr. Denton recommends that the water of the underdrainage (which is essential for the due cultivation of clay) should be stored either in ponds, or, more wisely, in underground tanks, for the use of cattle.

A 10-horse power engine requires for the cultivation of an acre of land from 100 to 125 gallons of water, and an underground tank capable of holding 2500 gallons would, therefore, be sufficient for the cultivation of 20 acres. For this quantity the tank should be 8 feet wide, 10 feet long, and 5 feet below the level of the drains, and, if concrete were used, the cost need not exceed £15 or £16. This tank might be placed in any position convenient for the steam plough or cultivator, and none here will deny the great value of such a supply of water wherever steam is employed in the cultivation of land situated on hills where water is now difficult to get.

A recently-published number of the "Transactions of the Institu-"tion of Surveyors" contains an important contribution to the pressing question of the utilization of sewage, in a paper "On Sewage "Farming," read by Mr. Hope, V.C., on May 5. Before extracting any of its facts and figures, it may be useful to note that in the discussion that followed it was stated that the Croydon system of what may be called "surface irrigation, as distinguished from filtration," has proved a disastrous failure to the company, whose lease has lately terminated, after a loss of £7000. It is quite true that the success of a sewage farm, like any other farm, will depend—even if it is cultivated *theoretically* in the best manner—on management and on markets. A sewage farm requires a variety of acquirements and accomplishments new at present, but which will soon be familiar and ordinary. We once now again repeat that the question that towns "under the "harrows of Chancery injunction" have to solve is how to get rid of a costly nuisance at the least expense and with the best results. If they apply sewage properly they may grow great crops, and if there be a succession of crops there will be no nuisance. At Mr. Hope's Breton Farm market garden crops form a large proportion of the produce.

The result of these is sometimes very good or very indifferent, according to the London markets. For instance, on one occasion I sold a crop of spinach for £30 an acre in the ground (the buyer to take it away), upon the twenty-ninth day after it was sown, while a crop of the same, sown a fortnight later, was unsaleable. On another occasion I carted away to the manure heap, from my other farm, a great part of a fine crop of cabbages, unsaleable at any price, and ploughed in the remaining part, where they grew on poorer portions of the land which I thought would be improved by the addition of the vegetable mould arising from their decomposition, while at other times I have sold cabbages at twopence a piece.

After producing a tabular summary of a year's crops, between March, 1871, and March, 1872, Mr. Hope continued:

The total acreage under successive crops, was 167·78, being the acreage of the different crops obtained from an actual acreage of 103·88, but I should mention that in this acreage the Italian rye-grass is taken as *one* crop, the successive cuttings not being counted as distinct crops. The total number of tons of produce was 2,714·445, although some of the crops, such as spinach, cauliflowers, parsley, French beans, peas, and strawberries, were of a nature which weigh very light. The total quantity of sewage applied was 380,226 tons, giving an average of 140·1 tons of sewage per ton of produce. The total quantity of nitrogen applied was 47,095 lbs. The total quantity of nitrogen escaping (almost entirely in a purified inorganic condition) was 5024 lbs. The total quantity of nitrogen recovered in the crops was 19,667 lbs., and that remaining in the soil or in the lower subsoil, below the level of the drains, or evaporated, was consequently 22,404 lbs., so that of every 100 lbs. of nitrogen applied to the farm only 10·67 per cent. escaped, and as much as 41·75 per cent. was actually recovered in the crops, and this although the laying out of the farm was by no means complete during a great part of the time. When it is considered that the experiments of Mr. Lawes and Dr. Gilbert have shown that the nitrogen recovered in crops, from all descriptions of solid manures, only ranges from 40 to 60 per cent., the result now shown cannot but be regarded not only as satisfactory but as surprising.

In spite of the excessive poverty and almost sterility of the greater part of the farm when I entered upon it in 1869, I have continued to export to my other farm every ounce of farmyard manure which I have been able to manufacture, and also, on several occasions, a certain portion of the sediment out of the sewage tanks; also that there are at this moment on the farm 39 cows, 1 bull, 12 calves, 15 horses, and 59 pigs, which latter are rapidly increasing. Not only are all these animals fed upon the produce of the farm, with the exception of maize purchased for the horses and for pigs being got up for show, but whenever I am short of cattle-food on my other farm I have always plenty to export to it, and I have, besides, been selling mangold wurtzel until the third week in April, when I thought it prudent to stop. And, although I have purchased maize for my horses, I have sold wheat, oats, and barley off the farm to an amount nearly equivalent to the maize purchased. Any of my pigs are, at any moment, fat enough to be killed and sent to market, for they get skim milk, buttermilk or whey, while the cows and bull are so fond of the cut Italian rye-grass that the stock-keeper complains that he cannot get them to eat corn or indeed anything else. The horses are now again receiving Italian rye-grass every day, and receive no other food besides their corn, yet the total acreage of rye-grass that I have provided, and which my experience proves to be sufficient for the maintenance of this stock, is only 15 acres. When you consider that, although all the manure made on the farm is exported, yet that all the rest of the farm is producing a constant never-ending succession of market garden or root crops, or occasional crops of Talavera spring wheat or of barley sown *about the 1st of June*, following winter cabbage, I think you will admit that a new era of farming has commenced, and that there is simply no other farm in the country which is supporting anything like the same head of stock per acre and which is also exporting such enormous weights of green crops, straw, and manure—in other words, producing so much food for the people, while satisfactorily disposing of the sewage question.

It seems that, in addition to all the other difficulties imposed on towns bound to get rid of sewage without creating a nuisance, the Sewage Utilization Acts, while permitting towns to sell their sewage for a period of 25 years, prohibit them from leasing their land for more than seven years. As to the Metropolitan Sewage Company, Mr. Hope says:

It cannot be too widely known that the non-carrying out of my scheme for the disposal of the sewage of London, or a modification of it, has not been owing to any inherent defects in the scheme itself, and has not been owing to want of funds on the part of the company. Twice over, and on two separate occasions, after incredible trouble, I got together capitalists in combination with manufacturing engineers, who made, to persons who formed the company, distinct and positive offers to provide the whole of the money required for a modification of the original scheme, and immediately to carry out the works for them within a period of two years; but these persons, nevertheless, asked conditions which they were told beforehand could not be accepted. Thus they stand before the public in the position of dogs in the manger. They will neither do that which they have undertaken to perform, nor will they allow any one to relieve them of what they call an intolerable burden one day and an invaluable property the next.

In the meantime the nuisance has been removed lower down the Thames, and it will probably remain there until it injures some powerful community.

Circular to Gas Companies.

THE Government have brought in a Bill to amend—as the technical phrase goes—the Municipal Corporations (Borough Funds) Act of last year. It consists of but three sections, the first of which alters the unmeaning title of the Act just mentioned, which may hereafter be cited as the "Local Authorities Funds Act, 1872," while the present measure may be cited as the "Local Authorities Funds Act, "1873." The next section is a very important one to statutory gas and water companies. After great efforts last year, the Gas and Water Companies Association succeeded in getting a proviso added to clause 2 of the Bill then under discussion, to the effect that "Nothing in this Act contained shall authorize any governing body "to promote any Bill in Parliament for the establishment of any gas "or water works to compete with any existing gas or water com- "pany established under any Act of Parliament." This proviso the Government propose to repeal, and if the Bill should pass, as it probably will, it reduces statutory companies to the condition in which non-statutory companies were left by the Act of last year. The one will be as much open to attack as the other. We do not expect that there are many Corporations who would care to have competing works on their hands. Companies already in possession of the ground could always undersell them, at the risk of making little or no profit, it is true; but in the meantime the ratepayers would suffer by the positive loss incurred by the Corporation or other local authority, and this gives importance to section 3 of the Bill under consideration, which proposes to repeal the following proviso to clause 4 of the principal Act:—"Provided further, that no expense in "promoting or opposing any Bill in Parliament shall be charged as "aforesaid, unless such promotion or opposition shall have had the "consent of the owners and ratepayers of that district, to be expressed "by resolution in the manner provided in the Local Government Act "for the adoption of that Act." This it will be seen by a reference to the principal Act (see JOURNAL OF GAS LIGHTING, &c., vol. xxi., page 727) leaves "an absolute majority of the whole number of the "governing body, at a meeting of the governing body," completely unfettered in the expenditure of public funds in parliamentary contests. We much doubt the wisdom of repealing the above proviso. If it could be said that the members of Corporations and Local Boards fairly represented public opinion, nothing could be urged against the repeal of the proviso, which necessitated a poll of the district on a special question. But, unfortunately, except under particular circumstances, great apathy is exhibited by ratepayers in the election of representatives, and in the end cunning and self-seeking men generally come to the front in such contests. The proviso was therefore a safeguard against the squandering of public funds, in opposition to the will of a majority of ratepayers; and we are astonished to see a Government, which professes so much admiration of the principle of local self-government, removing a restriction which provided for a direct appeal to the people on an important question. The Bill, as we have said, will probably pass, but it is none the less incumbent on companies, the largest ratepayers in districts, to make their voices heard against this measure, which we regard as totally uncalled for.

In November, 1866, the York Gas Company contracted with the Corporation of that city to furnish public lamps, supply them with 5 feet of gas per hour, light, clean, and repair the lamps at the rate of £3 1s. 6d. per lamp per annum, the contract being terminable by either party on giving six months notice previous to Jan. 1 of any year. In January, 1870, the company, unsolicited, reduced the price to £2 19s., the next year they made a further reduction to £2 15s. 6d., and last year they went still lower and charged only £2 10s. 6d. During this time no notice has been given on either side to terminate the contract entered into in 1866. Now, however, the time has come when most gas companies, and not a few Corporations, find it necessary to raise the price of gas, and the York Company have given the Corporation notice of their intention to advance the charge to £2 19s. per lamp from the 1st of July next, the price being still 2s. 6d. under that contracted for in 1866. The Corporation, with almost incredible meanness, are contending that the voluntary reductions of price were tantamount to a cancelment of the original contract and the conclusion of a new one, and, consequently, that the price cannot now be altered without six months notice previous to Jan. 1 in some year. If the company had taken this view, the reductions we have mentioned would have been delayed for twelve months, the company having resolved to make them in August in each year. The company's position we believe to be unassailable. Fortified by, perhaps, the best legal opinion to be had, they urge that a contract under seal cannot be varied except by another agreement under seal, and that the reductions were purely voluntary concessions; and how, after having been so generously treated, the Corporation can, under present circumstances, have the conscience to resist the advance, would be a mystery to us if we had not had so much experience of corporate doings. We are happy to believe that the inhabitants of York do not share the feelings of the council. An advance of price to private consumers has been willingly acquiesced in, and the gas company is deservedly popular in the city. The price it is now proposed to charge for public lamps in York is, we rather think, the lowest charged by any company, and the gas is of excellent quality. The Corporation are taking a legal opinion on the contract question, and if they get one in their favour, we presume they will resist the demand of the company.

We may mention here that the Corporation of Bradford, a city better situated than York for gas manufacture, have raised the price to 3s. 6d., while the advanced price in York is only 3s. 4d. The commissioners in Dundee have raised the price of gas in Dundee from 4s. 2d. to 6s., and in the outskirts in an equal proportion. As rich cannel gas is supplied here, the price is never likely to be lower.

The proceedings of a committee of the vestry of St. Pancras, reported in another column, lead us to hope that a better feeling is springing up in metropolitan District Boards in their relations with gas companies. We have mentioned more than once the very general dissatisfaction expressed as regards the public lighting of parts of the metropolis, and although we believe the discontent to be to a great extent unjustified, we have pointed out the true remedy for this state of feeling—viz., the adoption of the average meter indication system. Any man with a practised eye, who walks the streets, sees now and then a lamp consuming 3 or 4 feet per hour, but he never goes far without seeing others consuming 6 or 7 feet. This irregularity is almost unavoidable, except at considerable expense, and the companies prefer to lose the gas rather than be at the cost of incessantly changing burners and regulators. But the vestryman will only see the small flames, and the impression on his mind is that his Board are being defrauded, while in all probability the total quantity of gas consumed in a district is in excess of that contracted for. The average meter indication system levels the irregularities as regards cost, and we believe does justice to both parties; at all events, wherever applied it gives perfect satisfaction. In recommending the adoption of the system, the St. Pancras committee, with a liberality which deserves to be commended, fall in with a suggestion of the company that some allowance should be made for a somewhat larger consumption in the unmetered lamps, which must always be reckoned upon. The plan preferred by the committee is that adopted in Dublin, where the meters are placed in the base of the pillar. This will involve new posts all over the district—an expense which might be avoided by adopting the Nottingham plan, which cannot be improved upon. We may remark, too, that a pillar with a large base will encroach on the footway, already sufficiently occupied in most parts of London; and as the movement inaugurated by St. Pancras is sure to spread in the metropolis, this matter deserves consideration. Let us hope that the spirit shown by the St. Pancras Vestry will be imitated by other Local Boards, and that when they imagine they have a grievance against a gas company, they will, instead of listening to the mendacious statements of venal agitators, fairly meet the directors of the company, and hear and see for themselves. In this way much heartburning and a great deal of money may be saved, and a good understanding be established between the company and the board, tending to the advantage of both.

Readers who take the trouble to peruse the patent specifications we are constrained to publish, will have been greatly amused by one of the two we inserted in our last. We shall say little of Mr. Ruck's "new gas" patent. It simply describes a process which in one form or another is nearly as old as gas-making. Mr. Harrison's patent is one of those that could only receive the Great Seal under a law which is a disgrace to the intelligence of the nation. It starts with the assertion that the light-giving property of certain gases is increased by an admixture of atmospheric air, and at the close we are told what proportions of air cannel gas will bear to arrive at a maximum of illuminating and heating power. The affectation of scientific precision is perhaps the most amusing characteristic of the specification. The quantity of air that may be used is ascertained by means of a photometer. Given a quantity of any particular gas (say rich cannel) in a holder, the gas is to be lighted at a burner in connexion with a photometer, and air is then to be forced into the holder and mixed with the gas; "and as it is introduced," says this specification, "the flame under observation will be found to increase in "luminosity." The addition of air is to be continued as long as the flame shows increasing luminosity. According to the concluding paragraph of the specification, the gas given off from cannel coal at a red heat during the first hour of distillation, and having the specific gravity of about ·680, arrives at a maximum of illuminating power after it has been mixed with *four or five times its volume of air*. We never experimented with gas of this quality, and we do not believe that Mr. Harrison ever has; but, so far as common gas is concerned, we may inform him, and we hope it will be news to him, that the addition of but 1 per cent. by volume of air diminishes the illuminating power of the gas 6 per cent., and that after the addition of 40 per cent. of air (not half the volume) the illuminating power is practically destroyed. To our readers the statement we have quoted can only be a matter of amusement, but it must be remembered that this is only one of a few patents, no less monstrous, for which an ignorant and credulous public have been induced to pay, we rather think, £120,000! It is really time for law officers of the Crown, who have the granting of patents, to consider whether they are properly fulfilling their duty in assisting the propagation of such monstrous *delusions*—the only term allowed us here. Without reference to this invention, we may ask a conscientious man, like the present Attorney-General, whether a short Act might not be passed requiring an inventor to swear to the truth of his statements, so that he might be prosecuted for perjury if they were proved to be false.

The meetings of the British and North British Associations of Gas Managers at Edinburgh have passed off with much *éclat*. They met under the same roof, but not together, and it has been decided that no amalgamation shall take place. If the two associations had united, it would have been necessary to give the meetings a longer duration. As it was, in the case of the British Association alone, any discussion after the papers was almost precluded by the shortness of the time, and more is often learnt from the discussion than from the paper. In all the festivities the two associations joined, and too much praise cannot be given to the liberality, almost prodigal, displayed by our Scottish brethren. The meeting will leave most agreeable reminiscences in the memory of all the members who were so fortunate as to be present. We print to-day the president's address, and a general account of the meeting and entertainments. The papers and Dr. Macadam's lecture will follow in due course.

The importance of the coal question induces us to call our readers attention here to a work* which they will read with interest, if not with profit. It consists of three essays contributed to the *Edinburgh Review*, the first in the book, "On the Consumption and Cost of Coal," being the last written, and the only one, together with the appendix, with which we need concern ourselves. The other two, "On the Coal-"fields of North America and Great Britain," and "On Fatal Acci-"dents in Coal Mines," contain much information, but do not deal with the questions which press on us to-day. These are mainly three—1. What are the causes of the present price of coal? 2. What are the probabilities of an early reduction? and 3. What are our prospects in the future?

To the first question the answer is plain. The enormous development of our manufacturing industries, and particularly of the manufacture of iron, has created a constantly increasing demand for coal. Prices began to rise with accelerated speed in 1869, but it was not till the latter end of 1870 that the continual advance attracted much attention. At the beginning of last year the advances were such as to produce a pretty general consternation. Coal had in this time doubled in price, and people are anxious to know the reason why. Two causes are commonly assigned—a combination of colliery proprietors, and the exorbitant demands of the miners. As regards the latter, we may say at once that the advance in price preceded, and was the cause of the colliers demands; and as regards the former, we may quote from the appendix to this book the answer given by Mr. R. Tennant, a coalowner at Leeds, to a question put by Mr. Mundella's committee. "I will not be certain," said that gentleman, "that the price of coal would have increased as it did, unless there had "been some sort of arrangement among coalowners that it should "rise." To this we may add the evidence of Mr. Lowthian Bell, one of the latest witnesses examined by the commission, that "the "increase in the wages of the colliers have added about 1s. 6d. to "the cost of a ton of coals." From the evidence before us at the time, we made the same statement some months ago. On the other hand, we are told in this book that the coalowners in Northumberland and Durham are said to have realized in the past year 13s. per ton profit on their coal; and this, calculated on the output of the two counties, and equally distributed among the two hundred proprietors, would give each an income for the year of £100,000—"a liberal "reward," Mr. Leifchild remarks, "for the exercise of an enlightened "self-interest." We do not attribute blame to the proprietors. Coal, like everything else, is worth what it will fetch; and if our manufacturers, who are certainly not starving, can afford to pay the price, by all means let the owners have the profit, but they ought not to abuse the colliers. We may just refer, in passing, to the coal supply of London for domestic purposes, which we read is in the hands of about twenty merchants, who can make the price of coal exactly what they please in the metropolis!

As regards the probabilities of an early reduction of price, we are sorry to say that we can see few. And yet, perhaps, we ought to rejoice. Such a reduction, it seems clear, can only result from a general depression in manufacturing industry, which would be most disastrous to the country. For the general welfare of the nation we hope for a continuation of the present state of things, and prefer not to speculate on what will happen when that "creaking wheel at "Manchester shall stand still," as M. Michelet puts it, or the roar of our iron industry shall cease.

Assuming, then, as we hope for, a continually increasing demand for coal, we turn to the third question—What are our prospects in the future? Coal we have still in plenty—enough, at easily accessible depths, we are assured, to last, with double our present consumption, at least 360 years. Some say three times that period, but the shortest time is enough for us. But, supposing the consumption to go on increasing, how is the quantity required to be raised from the pits? A deficiency of labour, not to be altogether accounted for by the colliers laziness, is already observed at the mines. Numerous pits are being opened in new districts, but where is the labour to work them to come from? Much is expected of coal-cutting machines, now much in the same stage of development as steam stokers—or, perhaps, not quite so far advanced. But these are only adapted for the thicker seams; the thinner and the more numerous must still be worked by hand labour, which is becoming scarcer and scarcer. The agricultural labourer is looked forward to by some as the remedy. Doubtless it would be a benefit to all parties if we could transport that Oxfordshire peasant, now earning his 9s. a week, to a coal-pit in which he could earn as much in a day, if he had experience and was physically adapted for the work. But he is not. The weazle-backed hewer of thin seams of coal must be, so to speak, moulded for his work from boyhood; and boys show less and less inclination to work in mines, while Parliament at least discourages their employment.

Much is said in this essay about the waste of coal in this country. Of course much is wasted, as everything else is in this most wasteful of all countries. But this waste of coal is to a great extent inevitable. We have striven and are still striving to economize in its use for the production of force, but our success is small. To effect any great economy in its use in our households would necessitate the reconstruction of our dwellings, and a complete change in our habits. But little saving, therefore, can be looked for in this direction.

We have said enough to show that the immediate prospects of our particular industry are not hopeful. The writer of these essays asserts that "nearly all gas companies are prosperous." We wish it was so. In another place he remarks, "Gasometers appear in all "directions, and gas companies will abound and thrive until they "also feel the cost of coal—(as they do now, we may say)—and en-"deavour to raise the price of gas, from doing which many of them "are restricted by their Acts of Parliament; but ultimately they "must follow the imperious law of higher prices or smaller profits to "their shareholders." This is perfectly true, and it is disgusting to see a combination in the House of Lords, many members of which have shared the extravagant profit on coal we have mentioned above, that will, unless firmly resisted in the Commons, prevent gas companies from making the reasonable profits the Legislature has hitherto permitted.

Since the above was in type we have received from the secretary of the Gas and Water Companies Association the letter and petition printed below. We urge on our readers the policy of forwarding their petitions immediately.

* "On Coal at Home and Abroad, with relation to Consumption, Cost, Demand, and Supply, and other Inquiries of Present Interest," being three articles contributed to the *Edinburgh Review*. With an appendix. By J. R. Leifchild, M.A., &c. London: Longman, Green, and Co., 1873.

Correspondence.

MUNICIPAL CORPORATIONS (BOROUGH FUNDS) BILL.

DEAR SIR,—I shall feel obliged if you will call the attention of gas and water companies to a bill recently introduced by Her Majesty's Government to repeal some of the provisions of the Municipal Corporations (Borough Funds) Act of last session.

The bill for this Act was, as your readers will doubtless recollect, first introduced by a private member in 1871, when, after being on the notices of the House almost to the close of the session, and opposed by the gas and water companies at every stage, it was withdrawn.

In 1872 it was introduced again in the same way, and was again opposed by the companies. Her Majesty's Government were asked more than once during the session to adopt it, and declined; but ultimately, towards the end of the session, they agreed to make it a Government measure, and carried it through.

The bill as introduced, both in 1871 and 1872, proposed to give power to local authorities to promote or oppose any private bill for gas, water, or other purposes, and this provision was continued in it until Government took it up. After Government had adopted it, it was arranged with the agents for the companies that if the companies would agree to the local authorities having power to oppose bills promoted by the companies, the power of local authorities to promote bills for competing schemes should be struck out, and thereupon a proviso was inserted to that effect. The bill now introduced repeals that proviso.

Leave was given to bring in the bill on the 9th, and on that day it was read a first time, ordered to be printed, and set down for second reading on Monday, the 16th (this day). The bill, however, although it only consists of one side of foolscap, was not issued to the public until Friday, the 14th, and then only to a very limited extent.

It is to be hoped that the second reading, which stands for to-night, will be adjourned; but, if not, it will be passed without the persons whose property is so seriously affected by it having any means of knowing what its provisions are.

There are but three clauses in the bill. The third clause repeals some other provisions, to which the companies might reasonably object; but, as it is more especially a ratepayers question, it would not be desirable to mix that up with the other, which so specially affects gas and water companies.

I send the form of a petition, and recommend all companies not only to present petitions, but to use their influence in every legitimate way to get clause two rejected.

W. LIVESEY, Secretary.

Gas and Water Companies Association, 6, Victoria Street, Westminster, June 16, 1873.

IN PARLIAMENT. SESSION 1873.

HOUSE OF COMMONS.

Municipal Corporations (Borough Funds) Bill.

To the Honourable the Commons of the United Kingdom of Great Britain and Ireland in Parliament assembled.

The Humble Petition of . . . . . Company,

Sheweth,—That a bill has recently been introduced into your Honourable House, at the instance of Her Majesty's Government, to amend an Act of last session, intituled "An Act to authorize the application of Funds of Municipal Corporations and other Governing Bodies in certain cases."

That the said bill contains the following, with two other clauses:—

CLAUSE 2. "The following proviso in section two of the principal Act—viz., 'Provided that nothing in this Act contained shall authorize any governing body to promote any bill in Parliament for establishment of any gas and water works to compete with any gas or water company established under any Act of Parliament,' is hereby repealed."

The Act before mentioned was first introduced by a private member in 1871, when, after being on the paper of the House almost to the end of the session, and opposed by the gas and water companies, it was finally withdrawn.

In 1872 it was introduced again in the same way, and was again opposed by the gas and water companies. Her Majesty's Government were asked more than once during the session to adopt it, and declined; but, towards the end of the session, they agreed to make it a Government measure, and as such it was passed.

The bill as introduced, both in 1871 and 1872, proposed to give power to local authorities to promote or oppose any bills in Parliament relating to gas, water, or other purposes, and this power was continued in it until Government adopted it; but after that it was arranged with the agents of the companies that, if the companies would agree to the local authorities having power to oppose bills promoted by the companies, the power of the local authorities to promote bills for competing schemes should be struck out, and therefore a proviso was inserted to that effect.

The bill now introduced repeals that proviso, and authorizes local authorities, after the gas and water companies have invested their capital, upon the faith of Acts of Parliament, in these undertakings, to promote other schemes to compete therewith out of public rates, to which the companies in their respective districts are, in many cases, the largest contributors.

Your petitioners humbly submit that the provision now sought to be repealed was inserted in the Act of last year for their protection, and they protest against its being repealed without their consent. They further protest against the principle sought to be established by the bill as unjust in itself, and in direct violation of all the laws and customs of the country.

Your petitioners humbly call attention to the fact that leave was given by your Honourable House to introduce the bill on the 9th of June, and on that day it was read a first time, ordered to be printed, and set down for second reading on Monday, the 16th inst.; but prints of the bill were not issued until Friday, the 13th inst., and even then only a very limited number could be obtained.

The bill as it now stands very prejudicially affects private property in all parts of the kingdom, amounting to many millions sterling, which have been invested upon the faith of Acts of Parliament; and your petitioners humbly submit that with bills of this character there ought always to be a wide interval between the issuing of the bill to the public and the second reading, to enable all the parties whose interests are affected thereby to make themselves acquainted with its contents.

Your petitioners, therefore, humbly pray that the bill may not be allowed to pass as it now stands; but that clause two, which was inserted in the Act of last session for their protection, may, in justice to your petitioners, be struck out of the bill.

Parliamentary Intelligence.

HOUSE OF LORDS.

MONDAY, JUNE 9, 1873.

NOTTINGHAM GAS BILL.—The Chairman of Committees informed the House that the opposition to this bill was withdrawn.

DUMBARTON BURGH BILL.—The Lord Chancellor informed the House that the further Standing Orders applicable to this bill had been complied with.

GOSPORT GAS BILL.—Read third time, passed, and sent to the Commons.

Ayr Burgh, Glasgow Corporation Gas, Newcastle-upon-Tyne and Gateshead Gas, and Uxbridge and Hillingdon Gas Bills brought from Commons, read first time, and referred to Examiner.

Over Darwen Local Board of Health Bill returned from Commons agreed to, with amendments. The said amendments considered and agreed to.

Bournemouth Gas and Water, Harrow Gas, and Sutton Southcoates and Drypool Gas Bills, returned from Commons with the amendments agreed to.

GAS COMPANIES (METROPOLIS).—Certificated accounts of the metropolitan gas companies for the year 1872 were presented, and ordered to be printed.

POLLUTION OF RIVERS BILL.—Petitions were presented in favour of, by Mayor, &c., of Worcester; against, by Association of Paper Makers of Scotland and elsewhere.

Gas and Water Provisional Orders Confirmation (No. 2) Bill read second time (according to order), and committed to committee of the whole House to-morrow.

TUESDAY, JUNE 10.

The LORD CHANCELLOR acquainted the House that no further Standing Orders are applicable to the Lincoln Gas and Atherton Local Board Bills.

Belfast Gas Bill read third time, with amendments, passed, and sent to Commons.

Colne Valley Water Bill, returned from the Commons agreed to, with amendments. The said amendments considered and agreed to.

POLLUTION OF RIVERS BILL.—A petition in favour of this bill was presented by Conservators of the River Dee Fishery District.

Doncaster Corporation Water Bill was referred to a Select Committee, consisting of Earl Portarlington, Lord Foxford, Lord Heytesbury, Lord Penrhyn (chairman), and Lord Waveney, to meet on Monday, June 16.

GAS AND WATER PROVISIONAL ORDERS CONFIRMATION (NO. 2) BILL.—The House went into committee (according to order). Bill reported without amendment.

THURSDAY, JUNE 12.

Dumbarton Burgh Bill read second time and committed.

DEWSBURY AND BATLEY CORPORATIONS GAS BILL.—Report that the Standing Orders not complied with in respect of this bill ought to be dispensed with, and the bill allowed to proceed. Read and agreed to.

Gas and Water Provisional Orders Confirmation (No. 2) Bill was read third time (according to order), amendments made, bill passed, and sent to Commons.

Brighton and Hove Gas and The Gaslight and Coke Company's Bills were referred to a Select Committee, consisting of Earl Devon (chairman), Earl Morton, Lord Abercrombie, Lord Monteagle of Brandon, and Lord Ragian, to sit on Monday, June 16.

GASLIGHT AND COKE COMPANY'S BILL.—A petition against this bill was presented from the inhabitants of the parish of St. Mary Abbotts, Kensington, in public meeting assembled (signed by the chairman).

FRIDAY, JUNE 13.

Lincoln Gas Bill was read a second time and committed; Atherton Local Board Bill was read a second time, and committed for Tuesday next.

AIR BURGH BILL.—The LORD CHANCELLOR informed the House that the further Standing Orders applicable to this bill have been complied with.

Partick, Hillhead, and Maryhill Gas; Barrow-in-Furness Corporation and Dumbarton Burgh Bills, were referred to a Select Committee, consisting of the Duke of Manchester (chairman), Earl Manvers, Lord Ross, Lord Oranmore and Browne, and Lord Kildare; to meet on Tuesday, June 17.

HOUSE OF COMMONS.

THURSDAY, JUNE 5.

HARROW GAS AND SUTTON SOUTHCOATES AND DRYPOOL GAS BILLS.—Lords amendments agreed to.

Ayr Burgh, Glasgow Corporation Gas, and Newcastle-upon-Tyne and Gateshead Bills, read third time, and passed.

Colne Valley Water Bill (Lords), as amended, considered; bill to be read third time.

Briton Ferry Local Board (Lords) and Mid-Lothian Water (Lords) Bills read second time, and committed.

FRIDAY, JUNE 6.

BOURNEMOUTH GAS AND WATER BILL.—Lords amendments agreed to.

Over Darwen Local Board of Health Bill (Lords) read third time, and passed, with an amendment.

Uxbridge and Hillingdon Gas Bill read third time, and passed.

GAS STOKERS STRIKE IN THE METROPOLIS.

Mr. VERNON HARCOURT called attention to the law affecting contracts of masters and servants, and the law of conspiracy in connexion with the recent conviction of gas stokers. With regard to the sentence of Justice Brett in that case, he would say nothing harsher than that it had been condemned by the universal voice of the country, but the judge was only carrying out the intentions of the Legislature, and the real responsibility rested not on him but on Parliament. Tracing the history of recent legislation on this subject, which he characterized as rash and inconsiderate, arising out of the Trades Union Commission, and applying it to the gas strike, he maintained that apart from the breach of contract the act of the stokers in leaving their employment was not illegal according to the intent of Parliament. Commenting on the trial and the charge of Justice Brett, he contended that the law of conspiracy as there laid down entirely overrode the spirit of the Act of 1871, and converted every trades union into a conspiracy. The common law of conspiracy as thus declared ought to be amended, limited, and defined. Among other monstrous consequences of its loose doctrines, a man charged with conspiring to commit an offence might be more severely punished than the man who had actually committed it. He would have concluded by moving a resolution calling for an alteration of the law on these points, but was precluded by the forms of the House.

Lord ELCHO defended the Parliament which had passed the Masters and Servants Act, and from the evidence given before the Select Committee showed that the clause for enforcing contracts for service by imprisonment was passed with the consent, and on the advice, of the representatives of the working men. As to the law of conspiracy, he urged the Government to be careful how it made alterations in it at the bidding of combinations which avowedly sought to repress individual freedom.

Mr. B. OSBORNE commented on the severity of the punishment of the gas stokers, and urged the Government to undertake the amendment of the law of conspiracy and the abolition of the punishment of imprisonment for breaches of contract.

After some remarks by Mr. A. HERBERT,

The ATTORNEY-GENERAL commented on the extravagant misrepresentations in which Mr. Harcourt had indulged, which weakened his case, and made it impossible to follow him to all his conclusions. The gas stokers case, he pointed out, had no connexion with the Act of Parliament, but rested entirely on the common law; and, defending the House against the charge of class legislation, he showed that both the Masters and Workmen's Act and the Criminal Law Amendment Act largely diminished the number of misdemeanors, and that they drew no distinction between employers and employed. As to the law of conspiracy, he admitted that it was not in a satisfactory condition, especially if the propositions laid down by Justice Brett were to serve as new points of departure. He recommended Mr. Harcourt to apply himself to the preparation of a bill, and if he produced a satisfactory measure in this branch of the law he would have got over nine-tenths of the difficulty. But he did not agree with Mr. Harcourt's other propositions, that punishments for conspiracy should never be more severe than for the offence itself, and that under no circumstances should imprisonment be the penalty for breaches of a civil contract.

Dr. BALL protested against the House of Commons being made an appellate tribunal from the decisions of the judges, and declared that no judge could act freely who was liable to be criticized there by a barrister practising before him or by a law officer. As to Mr. Harcourt's propositions, he doubted altogether the possibility of defining the law of conspiracy more accurately, but thought that the complaints raised might be obviated by giving the Attorney-General a control over such prosecutions.

The SOLICITOR-GENERAL dissented altogether from the doctrine that judicial decisions were not to be discussed in Parliament. He agreed, however, with Dr. Ball on the difficulty of defining the law of conspiracy. As to class legislation, workmen had no more right thus to speak of the Acts than thieves had to complain of the laws against larceny because they were most likely to be touched by them. With regard to the gas stokers case, he dissented altogether from the first proposition of Justice Brett's charge, preferring Mr. Justice Lush's ruling in a later case, and he advised the House, before legislating, to wait until the law had been authoritatively settled by the Court of Criminal Appeal.

Mr. H. JAMES criticized Justice Brett's charge, and defended the right of workmen to combine for the regulation of their hours of labour and rate of wages.

Mr. BRUCE deprecated further legislation until the present Acts had had a full trial, and expressed a hope that in course of time this species of legislation would be unnecessary.

Mr. EYKYN wound up the discussion by declaring that the gas stokers had been fitly punished.

MONDAY, JUNE 9.

Colne Valley Water Bill (Lords) read third time, and passed, with amendments.

GAS COMPANIES (METROPOLIS).—Accounts relative thereto were presented.

METROPOLIS WATER SUPPLY.

Mr. AGAR-ELLIS asked the Secretary of State for the Home Department what steps he had taken, or was about to take, to remedy the defects in the Metropolis Water Act, 1871, as the constant supply clauses had proved to be altogether inoperative for ensuring a constant high-pressure service of water in the metropolis.

Mr. STANSFELD: As the subject comes into my department I will answer the honourable gentleman's question. The state of the law is that it rests with the Metropolitan Board of Works, in the first instance, to require a constant supply of water, and if they refuse to make the request, or there is any unreasonable delay in making it, the Local Government Board can take the matter in hand. I am not aware that any action has been taken by the Metropolitan Board of Works in the matter; but if there be any unreasonable delay in the matter, the Local Government Board will have to consider what steps it is desirable to take.

MUNICIPAL CORPORATIONS (BOROUGH FUNDS) ACT AMENDMENT BILL.

Mr. WINTERBOTHAM, in the absence of Mr. Secretary Bruce, moved for leave to bring in a bill to amend an Act of the session of the 35th and 36th years of the reign of Her present Majesty, chapter 91, intituled, "An Act to authorize the application of Funds of Municipal Corporations and other governing bodies in certain cases."

The motion was agreed to without discussion, and the bill was brought in and read a first time.

TUESDAY, JUNE 10.

GAS COMPANIES (METROPOLIS).—Accounts presented June 9 relative thereto were ordered to be printed.

Gosport Gas Bill (Lords) read first time.

Bradford Improvement (Lords) and Mid-Lothian Water (Lords) Bills were referred to a select committee, consisting of Lord March (chairman), Mr. Eykyn, Mr. Cave, and Mr. Feilden; to meet on Tuesday, June 17.

WEDNESDAY, JUNE 11.

THE GAS STOKERS STRIKE.—Mr. Vernon Harcourt obtained leave to bring in a bill to amend the law of conspiracy as applied to masters and servants.

THURSDAY, JUNE 12.

THE GAS STOKERS STRIKE.—A bill to amend the law of conspiracy was brought in by Mr. Vernon Harcourt, and read the first time. To be read second time on Thursday, June 19.

FRIDAY, JUNE 13.

Portsmouth Borough Water and Briton Ferry Local Board Bills, being unopposed, were referred to a committee, consisting of the Chairman of Ways and Means, Mr. Yorke, and Mr. Rickards, referree; to meet on Thursday, June 19.

HOUSE OF COMMONS.

FRIDAY, APRIL 25.

(*Before Col.* DAWSON, *Chairman; Sir* CHARLES DILKE, *Sir* R. TORRENS, *and Mr.* REDMOND—*Mr.* A. BONHAM-CARTER, *Referee.*)

PARTICK, HILLHEAD, AND MARYHILL GAS BILL.

Mr. RODWELL, Q.C., and Mr. ANDERSON appeared for the promoters; Mr. POPE, Q.C., Mr. CLERK, Q.C., and Mr. WILLS for the Corporation of Glasgow; and Mr. GRAHAME for the Kelvinside Trustees, petitioners against the bill.

Mr. RODWELL, in opening the case for the promoters, said this was not a bill for creating a new company, but for conferring statutory powers upon an existing gas company. The company had been formed under the General Joint-Stock Companies Act, and they were at the present moment carrying on the business of supply of gas greatly to the benefit of Partick and neighbourhood. The only question which the committee had to decide was whether the company were to remain as they were, a mere joint-stock company, or were to be clothed with statutory powers and brought within the operation of the Gas Acts. Under their present constitution the company was subject to certain disadvantages. They could not exercise any compulsory powers, nor could they break up roads or streets without being a great deal at the mercy of the local authorities and of private individuals. Whilst, however, the company on their present footing were subject to certain disadvantages, they had compensating advantages. For instance, they could earn any amount of dividend they pleased, and were not bound by the general Acts to which incorporated gas companies were subject. One would have thought that the object sought

to be accomplished by the bill was of too unexceptionable a character to have raised any objection; but such, it would appear, was not the case. The Corporation of Glasgow had come forward in opposition to the bill, and were prepared to ask the committee to reject it. That corporation were determined, if possible, that they alone should have parliamentary powers within the Partick district. The struggle, therefore, lay between the Corporation of Glasgow and the gas company which he represented. All that the Partick Gas Company asked was to be let alone to manage their own affairs. They did not want to interfere with Glasgow, and what they strongly objected to was that Glasgow should be allowed to interfere with them. There was also a petition against the bill from the trustees of the Kelvinside estate, who objected to the gas company getting compulsory powers to break up the road running through their estate for the purpose of laying down pipes. Those trustees were the owners of the *solum* or soil of the road in question, but they had no control over it, because it had been a public highway for a hundred years. He argued, therefore, that the gas company ought not to be made to pay compensation to these trustees for opening the road, inasmuch as the only persons who would suffer any inconvenience would be, not the trustees, but the public, who used the road as passengers over it.

Mr. GRAHAME, who represented the Kelvinside Trustees, said he was in hopes that an arrangement would be come to between them and the promoters which would result in the trustees withdrawing their opposition.

The following evidence was then given for the promoters:—

Mr. *Geo. Thompson*, agent for the Royal Bank of Scotland at Partick; and chief magistrate of the burgh, said that since 1869 the population of that place had increased 5000, and the rental had within the same period increased by £30,000. He detailed the steps that had been taken from time to time for the supply of the burgh with gas, and the events that led to the establishment of of the present joint-stock company. He pointed out that the gas supplied by that company was excellent in quality; and that one result of the formation of the company was to cause the Glasgow corporation greatly to improve the quality of the gas which they had been supplying to Partick and the neighbourhood.

Cross-examined by Mr. CLERK, *witness* acknowledged that after the Glasgow Corporation had taken over the gas-works the price of gas to Glasgow and the outlying burghs was reduced. The old companies charged 4s. 7d., and that was reduced to 4s. 4½d., but the price for Glasgow itself was reduced to 4s. 2d. What he and the people of the outlying districts objected to was that they should be charged 2½d. more than the people of Glasgow. His belief was that if the old companies had remained in possession of the gas-works, Partick and Glasgow would have been charged precisely at the same rate.

Mr. CLERK: But then it is quite probable that the old companies would not have reduced the price of gas at all.

Mr. *Robert Hunter*, ex-Provost of Partick, corroborated generally the evidence of the previous witness.

Mr. *Wm. Hamilton*, assistant-manager to Messrs. Wylie and Lochhead, paper stainers, Whiteinch, said that when the gas came into the hands of the corporation the supply was of a very inferior quality to that formerly given. His firm had complained repeatedly, but without obtaining any remedy, and at last they took the gas of the joint-stock company, which was found to be much more satisfactory.

In cross-examination, *witness* admitted that a new main had recently been laid in Partick by the corporation, and that the result had been to improve the quality and pressure of the gas in his dwelling-house. He did not know whether this main had been laid in consequence of the complaints of which he had spoken.

MONDAY, APRIL 28.

Mr. ANDERSON, counsel for the promoters, intimated that since the committee met on Friday, the Kelvinside Trustees had withdrawn their opposition to the bill, so that the Glasgow Corporation were now the only opponents of the scheme.

Mr. *Robert Bruce*, chief magistrate of Hillhead, said that in 1871 the population of that burgh was 6200, and it was rapidly increasing. Last year the assessable value of the burgh was £60,404, and he had no doubt that by next year that value would be increased by some £19,000. He knew the feeling of the people of Hillhead; and, with respect to the gas question, the community were strongly of opinion that there should be a good supply of gas, and that it should be obtained at the lowest possible price. After the corporation took over the gas-works from the old companies great complaints were made both without and within the city, alike with respect to the price of the gas and its quality. He considered that the old companies gave much greater facilities to the population, in supplying pipes, &c., than the corporation. Moreover, the old companies laid pipes from the mains to the public lamps, but this was not done by the Glasgow Town Council. The consequence was that two or three lamps that had been erected by the police commissioners of Hillhead were not supplied with gas. After the differential rate had been imposed by the Glasgow Corporation, and when it was found that the gas supply was inferior, the dissatisfaction of the community became so great that the present gas company was started. Since that company had been established the supply of gas had been most satisfactory, so much so that the Commissioners of Police of the burgh had resolved to contract with the company for supplying gas to the lamps. He could not see any advantage to be derived from Hillhead getting its gas supply from Glasgow instead of from its own works.

Cross-examined by Mr. CLERK, *witness* said he was a shareholder and director of the Partick and Hillhead Gas Company. Under the old companies the charge for the gas was 4s. 7d., but the large consumers received a discount from the companies. When the Glasgow Corporation got the works they reduced the price of the gas. He could not say what it was that enabled them to do so, but he did not think it was by appropriating the profits derived from the sale of gas. Indeed, so far was this from being the case, that the general belief in Glasgow recently was that the corporation had appropriated about £5000 of the profits of the gas to corporation purposes.

Mr. CLERK: Do you mean to say that such a thing was actually done?

Witness: It was proposed at all events; but I think the idea was rejected by a majority of two.

Mr. CLERK: Let me ask you whether your reason for starting the new company was the differential rate charged by the corporation in the outlying districts?

Witness: Yes, partly on that account and partly on account of the bad quality of their gas.

Mr. CLERK: But had not the grievance respecting the quality of the gas been remedied?

Witness: For the last few months the quality has been improved, but it is not yet up to the mark.

Mr. CLERK: What other grievance have you?

Witness: I think we pay for more than we burn.

Mr. CLERK: Why should you do that?

Witness: I do not see any reason why we should.

Mr. CLERK: But why do you, when the quality and the rate are fixed by Act of Parliament?

Witness: Because the Town Council fix the rate.

Mr. *George Russell Alexander*, magistrate of Hillhead, and the convener of the Gas and Lighting Committee, said that the light which had been supplied by the Glasgow Corporation was so inferior that great complaints were made of it. He had suggested a remedy by the introduction of superior burners, which would have given a light half as good again, but the Glasgow Corporation would not agree to that, except on the condition that the present price should be doubled. He felt that he could not recommend such a thing to the Hillhead Commissioners, and they had consequently to go on under the old system. By way of illustrating the difficulties encountered in dealing with the Glasgow Town Council, he instanced the case of a terrace in the burgh. Application was made to the Glasgow Corporation to have this terrace lighted, but they refused except the Hillhead people paid the expense of laying down the service-pipes. As soon, however, as the new company was started that company laid down these service-pipes at their own expense, and the terrace was lighted. The new company would never have been got up if the Glasgow Corporation had not imposed the differential rate and supplied bad gas.

The CHAIRMAN: Your three causes of complaint against the corporation are the differential rate, the bad quality of the gas, and the want of accommodation in supplying new street-lamps with gas?

Witness: Yes.

Mr. *James Shaw*, chief magistrate of Maryhill, said that all the public lamps in that burgh were supplied by the present Patrick and Hillhead Company. That had been the case since the 1st of January last. He corroborated the last witness in his evidence.

Mr. *David Swan*, timber merchant, Maryhill, for 13 years chief magistrate of that burgh, and one of the founders of the old Maryhill Gas Company in 1845, was also very briefly examined in support of the bill.

Mr. *John Duncanson*, master builder in Glasgow, and at present deacon of the building trade there, was next examined. He remembered the time when the corporation of that city took over the works of the old gas companies. Since that transfer there had been a detrimental change. Formerly the old gas companies put in the pipes at their own expense, but now the corporation charged consumers for the putting in of these pipes. Latterly, however, since competition had sprung up, the corporation had put in pipes on property of his without charging him for them, and continued doing so until he stopped them. His opinion was that the quality of the gas became worse after the corporation took over the works.

In cross-examination, *witness* said he had stopped the putting in of the pipes because, when he asked the corporation for a written guarantee that they would not charge him for the pipes, they refused to give him that guarantee.

Mr. *Peter M'Kissoc*, builder, gave testimony to the effect that the gas supplied by the corporation was of inferior quality, but that no complaint had been raised against that supplied by the Partick and Hillhead Company.

Mr. *Henry Simpson*, merchant, residing near the Kelvinside estate; Mr. *Wingate*, of the firm of Messrs. Thomas Wingate and Co., shipbuilders at Whiteinch, in the district of Partick; Mr. *Kirkwood*, land agent, Glasgow; Mr. *Thos. Cameron*, merchant, Maryhill; and Mr. *Andrew Hyslop M'Lean*, merchant, of Glasgow, were also examined in favour of the bill.

TUESDAY, APRIL 29.

Mr. *William Brown*, chartered accountant, Glasgow, handed in a copy of the first annual report issued by the Glasgow Corporation after they had taken over the gas companies undertakings. That report, he stated, had been published in the *Glasgow Herald*, and contained the accounts in connexion with the gas supply up till the 30th of June, 1870. He was examined very minutely with respect to the figures contained in the report, and proved from them that during the three years the corporation had had the management of the gas the price of the gas had been reduced, and there remained in the hands of the corporation an unappropriated surplus, arising from profits, of £13,000. That surplus had been saved after making full provision for depreciation of plant and repairs, and also for a sinking-fund. He was not aware that anything had been done with the surplus. He had no doubt the corporation might carry that surplus to their general profits, and deal with it in any manner which they thought proper.

Cross-examined, *witness* stated that he considered the reduction in the price of the gas, and the accumulation of the surplus, showed that the gas-works had been well managed by the corporation. He was aware that the corporation had, since they got the gas-works, spent a great deal of money in extending their mains and laying down fresh pipes.

Mr. *Robert Morton*, engineer to the London Gas Company, said he had recently visited the Partick and Hillhead Gas-Works. The result of his inspection proved to his satisfaction that the works in question were well laid out, well arranged, and admirably situated for the manufacture and distribution of gas to the district. The works were constructed on the most approved principles, and would be capable of extension to any extent which the wants of the community might demand. The engines, boilers, retorts, and tanks would, in fact, if any such necessity arose, be able to produce twice as much gas as was at present demanded. His belief was that sound judgment and discretion had been exercised in the planning and erection of the works, both with reference to the present requirements of the district and any future demand. Moreover, the works were admirably situated for getting an abundant coal supply, distributing the gas, and getting rid of the residual products. Finally, he believed that the Partick and Hillhead Company would prove a remunerative undertaking to the shareholders.

Witness was cross-examined with the object of showing that the works of the promoters could not possibly be a paying concern. Witness admitted that gas cost 3s. per 1000 to manufacture, and as only 4s. per 1000 was to be charged for the gas to the public, 1s. was left. He was pressed to state how much of this would be left for the payment of dividend after rents were paid, depreciation provided for, and interest on borrowed money paid, but he did not express any opinion on the point. He admitted that among the advantages to be gained by keeping a district in the hands of one company were that the streets would not be so much broken up, and less capital would be invested.

Mr. *James Hyslop*, manager of the Partick, Hillhead, and Maryhill Gas Company, stated that he had designed the works of that company, and had prepared the estimates for the contracts. The new works were not completed till December last year, so as to enable the company to supply all its customers. He agreed with the last witness in all he had said as to the capacity of the works, and their capability of future development. A sum of £80,300 capital had been expended on the works. The company had laid down upwards of 28 miles of pipes. The daily consumption of gas supplied by the company was over 100,000 feet, and the number of meters supplied by the company was increasing at the rate of 30 a day. He had tested the gas supplied by the Corporation of Glasgow for four months between December, 1871, and May, 1872, and he found that the gas which ought to have had a minimum of 25 candles, had only a maximum of 20½ candles, and a minimum of 16 candles. He had also tested the gas supplied by the new Partick and Hillhead works, and he found the maximum illuminating power was 31, and the minimum 27 candles. He had not the slightest doubt that, if the price of coal remained as it was, they would be able to make a profit out of the manufacture of gas at 4s. per 1000.

Cross-examined, *witness* stated that the company, since its first establishment, had sold 13 million cubic feet of gas at 4s. per 1000. The largest quantity that had passed through their station-meter on any one day was 120,000 cubic feet.

This closed the case for the promoters.

Mr. POPE, for the corporation, said he did not propose to call any evidence.

Mr. RODWELL, for the promoters, said the announcement had taken him by the greatest surprise. Seeing the manner in which the statements of his

witnesses had been challenged, he certainly imagined that the corporation would have called evidence to rebut these statements. In these circumstances, and seeing that Mr. George Thompson had been asked by his learned friend, Mr. Clerk, to produce certain documents, thereby making him a witness for the opposition, he should maintain his right to reply to the speech which he presumed Mr. Pope would make to the committee.

Mr. POPE said he must object to that. It was a point which no lawyer in Westminster Hall would have raised.

Mr. RODWELL: We are not in Westminster Hall, and, for that matter, I sometimes go into Westminster Hall, and see very queer things done there.

After some conversation,

The CHAIRMAN said the feeling of the committee was against Mr. Rodwell having the right of reply, but if there was any material point in the objection they would consider it more fully at a future time.

Mr. POPE addressed the committee on behalf of the Corporation of Glasgow. He said the real question for the committee was whether they would sanction the destruction of the Acts of 1869, and he maintained that a well-regulated monopoly in the supply of gas was better for the public than a number of competing companies, with all the waste and inconvenience attendant on their working. The practical result of passing the bill would be that, in ten or twelve years, the Glasgow Corporation, or some other public authority, would have to absorb this undertaking, and pay any extreme price that might be asked for the property. He did not hesitate to express his opinion that this was the real meaning of the bill, and that if the corporation chose to negotiate for the works nothing more would be heard of the measure. With regard to the objection founded on differential rates, he would remind the committee that Parliament had sanctioned differential rates in more than a dozen instances, and, besides, Partick had been exempted from their operation.

The room was then cleared, and after deliberating about a quarter of an hour, the committee announced that the preamble of the bill was proved.

Mr. WILLS, for the corporation, stated that he would take no part in the discussion on the clauses.

The clauses were then adjusted, in conformity with the suggestion of Lord Redesdale, and the bill was ordered to be reported.

Miscellaneous News.

METROPOLIS GAS SUPPLY.

GAS SUPPLY OF ST. PANCRAS.

The General Purposes Committee of this vestry have issued the following report:—

Your committee have, in pursuance of reference, fully considered the subject of gas supply to the public lamps in connexion with the communication received from the Imperial Gas Company, giving notice to terminate their contract with the vestry on the 30th of June next. A sub-committee of your committee has been specially engaged in obtaining particulars with reference to gas supply generally, and particularly with regard to the gas supplied to public lamps. The sub-committee had an interview with the directors of the Imperial Gas Company on the 10th ult., and at that interview the directors plainly intimated that the company intended, upon the expiration of the present contract with the vestry, to raise the price of gas, so that the charge for the public lamps should be the same as the charge to private consumers—viz., 3s. 9d. per 1000 cubic feet.

It was urged on behalf of the vestry that some of the items of expenditure appearing in the company's published accounts as office management, collection of gas-rents, bad debts, &c., should be wholly or in greater part deducted in fixing the price of gas to a large public body like the vestry; by whom a sum of £14,000 a year was paid to the company without expenses necessary in other cases.

The question of purchasing gas by meter was raised with the directors on the ground that whereas the vestry would be charged upon an assumption that each lamp burned 5 feet per hour, other consumers would only pay for the amount actually consumed, measured by meter.

The directors urged on the other hand that the governors were a fair safeguard of the quantity of gas consumed in the lamps, and these governors could at any time be tested by the vestry.

The directors stated, however, that they could offer no objection to the vestry adopting the meter system, either by (1) one meter to each lamp; (2) the average meter system with an allowance in consideration of a metered lamp consuming less gas than one not metered; or (3) a separate supply from the main—all the gas to, say, ten lamps passing through one meter.

At the suggestion of the directors, the sub-committee again met at the Imperial Gas-Works, Pancras Road, on the 18th ult., to witness some experiments which had been made by the company to show the effect of a meter on the quantity of gas consumed in a lamp.

The chief inspector of the company (Mr. Hersey) quoted to the sub-committee an experiment in which two lamps, one with and the other without an outside meter (but both supplied through a meter fixed in a meter-house adjoining) consumed 170 and 160 cubic feet of gas respectively; the apparently smaller quantity being used by the metered lamp, and he attributed this loss to the company of 59 cubic feet per 1000 to the registration of the gas whilst cold, and to the obstruction of the meter. Mr. Hersey expressed an opinion that if the average meter system were adopted an allowance should be made in respect of the lamps not metered. The exact allowance in case of dispute to be agreed upon once for all after experiments by competent persons chosen from either side.

The sub-committee having attended at the gas-works to witness these experiments, availed themselves of the opportunity thus afforded for testing the accuracy of the governors used in the street-lamps.

The chief surveyor had, at the request of the sub-committee, caused four governors with burners to be removed from street-lamps. They were taken from different parts of the parish, and were selected as showing an average flame as compared with all other lamps in the vicinity whence they were taken. The four governors and burners were tested over a gasholder by the officers of the gas company and Dr. Stevenson, the gas examiner to the vestry. The result with a 1-inch pressure was as follows:—

Locality whence Governors, &c., were taken.	Quantity of Gas consumed with One-inch Pressure.
80, Albany Street	3·06
145, Tottenham Court Road	3·42
28, Hampstead Road	4·56
45, Johnson Street	4·8

The average of the four was therefore 3·96.

The four were afterwards tested at one time with a 2-inch pressure, and the average given was 3·99. The four were then cleansed by the company's servants, and again tested with a 2-inch pressure, the result being an average of 4·35.

The officers of the company afterwards had three governors and burners removed from Suffolk Street and tested, when the average was 5·96. The worst of these, being broken, was removed, and the other two showed an average of 5·55.

Two new burners from the stores were afterwards tested, and showed with a 1-inch pressure 5·04, and with a 2-inch pressure 5·46.

The company's officers stated that the burners would require cleansing, probably twice a week, and that the men had instructions to clean them when cleaning the lamps.

Your committee have considered the question of purchasing gas by meter, under four systems of meterage—viz.:

1. A supply from one meter by separate pipes, to say ten lamps.
2. A meter to each lamp.
3. The system of average meter indication, the meter being placed in a lamp column made for the purpose.
4. The same system with a meter placed in an iron box on the pavement, at the foot of the lamp column.

In the two latter cases the metered lamp is taken as an indication of the quantity of gas burned in the ten lamps nearest to it.

With regard to the adoption of the average meter system, the point which the gas company so strongly urge is that the unmetered lamp consumes more gas than the metered lamp, and that therefore some allowance should be made to the company in respect of the unmetered lamps if the average meter system were adopted. This part of the subject having been very fully considered, your committee are somewhat disposed to agree with the company that some allowance should be made.

Your committee are of opinion that the average meter system, which is already in operation in many of the towns of England and Ireland, is a satisfactory mode of purchasing gas by meter; and as to the two average meter systems—firstly, where the meter is placed in the column; and secondly, where the meter is placed in a box at the foot of the column—your committee are of opinion that the former is the best. They therefore recommend to the vestry that the gas to be supplied to the public lamps should be purchased according to the average meter system, and that the meters should be placed in lamp columns to be constructed for the purpose. Your committee present herewith a photograph of a lamp column now in use in Dublin, so constructed as that the meter is placed in the base of the column.

The cost of providing new lamp columns throughout the parish with lamps, burners, and governors, and all expenses for fixing, &c., would not exceed £3000. Your committee are of opinion that, taking the experiments on the burners and governors removed from the public lamps by order of the sub-committee as an evidence of the amount of gas which is burned in the public lamps under the present system, that the saving effected by adopting the meter system will be one-fifth of the present outlay for gas for the public lamps, and as the expenditure of the vestry under the present system (taking into consideration the increased price about to be paid to the company) will not be less than £16,000 per annum, your committee believe that a saving of at least £3000 per annum will be effected, and the same amount of light obtained as at present, or that a light one-fifth better than that now given can be obtained without any increase of price.

In all cases where the average meter system has been tried, it appears to have given satisfaction to the local authorities and to the ratepayers. Your committee have had before them particulars of the result of the system in Nottingham, Uxbridge, Dublin, Cork, and other places.

As regards lighting and extinguishing the lamps, and repairs to columns, lanterns, &c., your committee are of opinion that this will have to be done by a separate contract, under the supervision of an officer specially appointed by the vestry as inspector of public lighting. The company's charge for gas supply, lighting, &c., has been £4 8s. per lamp, estimated to burn five cubic feet per hour. The new charge will be £4 18s. Of these sums 18s. per annum is estimated to be for lighting, extinguishing, cleaning, and repairs. Your committe recommend that authority be given to them to obtain estimates as to the cost of carrying out the system proposed, and also to negotiate with the company as to whether any, and if any, what allowance should be made in respect of unmetered lamps, and to report further thereon.

At the meeting of the vestry on the 4th inst. the above report was adopted.

(Signed) JAMES HOPPEY, Chairman.

Dr. Whitmore's report on the illuminating power, pressure, and quality of the coal gas consumed in the parish of Marylebone:—

MAY, 1873.	Illuminating Power in Sperm Candles.			Mean Pressure in Tenths of an Inch.		Mean Quanty. of Sulphur in 100 Cu. Ft.	Mean Quanty. of Ammon.in 100 Cu. Ft.	Sulphuretted Hydrogen.
	*Mean of 24 Obser.	Highest.	Lowest.	Highest.	Lowest.	Grains.	Grains.	
Imperial Company's gas	16·26	16·70	15·90	23·83	9·62	35·62	0·40	None.
Chartered Company's common gas. . .	16·51	17·90	15·50	29·81	12·86	15·04	0·40	None.
Chartered Company's cannel gas . . .	24·10	26·60	22·60	21·42	11·0	20·47	0·45	None.

Mean of daily readings of barometer . . . 29·76
" " " thermometer . . . 61·72

* Each observation consists of ten readings of the photometer, at intervals of one minute.

During the month the mean illuminating power of the Imperial Company's gas was equal to that of 16·26 candles, it ranged between 15·90 and 16·70 candles; once only was it below 16 candles. The mean amount of sulphur found in 100 cubic feet of this gas was 35·62 grains, and of ammonia 0·4 of a grain. The mean light of the Chartered common gas was equal to 16½ candles; it ranged between 15·50 and 17·90 candles; three times was it below 16 candles, and four times above 17 candles. The mean quantity of sulphur found in it was 15 grains, and of ammonia 0·4 of a grain. The mean light of the cannel gas was equal to 24 candles; it ranged between 22·60 and 26·60 candles; once only was it below 23 candles, and twice above 26 candles. The mean quantity of sulphur found in it was 20·47 grains, and of ammonia 0·45 of a grain. In neither of the gases was sulphuretted hydrogen at any time detected by the ordinary tests. The pressure of all the gases was fair, that of the Chartered Company being, however, much lower than formerly. The above results were obtained from the common gas of the Chartered Company, manufactured at their Beckton and Bow works, and from the Imperial Company's gas, manufactured at their Fulham works.

At the meeting of the Metropolitan Board of Works, on Friday last, a letter was read from The Gaslight and Coke Company, stating that they propose to reduce from the 1st proximo the illuminating power of the cannel gas which they supply from 23 to 20 candles, accompanied by a corresponding reduction in price, and requesting, before finally resolving to do so, to be favoured with the views of the board on the subject. The chairman suggested that the letter should be referred to the Works Committee. Mr. Newton said the company wanted the answer of the board that day if they could obtain it. The letter was brought before the Works Committee, and he did not think there would be any objection to deal with the matter then. The company increased the illuminating power from 20 to 23 candles, and made a corresponding increase in the price of the gas. Consumers were dissatisfied, and now the company proposed to supply 20-candle gas, and for the reduction of 3 candles to take off 10d. per 1000 feet, which was a little more than they were required to do. He did not think that they should make any objection to the proposed alteration, but at the same time it was necessary that they should draw their resolution carefully, as the price now charged was only for one year. Mr. Bidgood said if the reduction of three candles secured 10d. being taken off the present price per 1000 feet, the ratepayers in his parish would be well pleased. Mr. Freeman saw no objection to the temporary alteration. At present the district supplied by this company was treated differently as to charge than the rest of the metropolis

and they should not be so isolated; and the company ought to be given to understand that they would require concessions from them. The chairman said this was rather an important question, and asked whether it was wise to have a discussion upon it at once. Mr. Roche said he would not object to the subject being referred to the committee. It was then agreed that the letter should be referred to the Works Committee, with power to act if necessary.

METROPOLIS WATER SUPPLY.

Major Bolton's Report on the Water Supplied to the Metropolis during May.

During the whole of the month of May the state of the river at Hampton, Molesey, and Sunbury, where the intake of the West Middlesex, Grand Junction, Southwark and Vauxhall, Lambeth, and East London Companies are situated, was good The highest flood state of the river at Hampton during the month was 8 inches above the (6 feet) summer level.

At Ditton (where the Chelsea Company now alone draws its supply) the state of the water in the river was good during the month. The highest state of the flood water at this place was 6 inches, and the lowest 4 inches, above summer level. The highest temperature of the water at Ditton during the month was 59°, and the lowest 50°, while the highest temperature of the air at the same place was 65°, and the lowest 46°. These observations were made daily at 9 a.m.

The construction at the earliest possible period of sufficient subsiding and impounding reservoirs by the Chelsea, Grand Junction, and Southwark and Vauxhall Companies is most desirable, and should receive immediate attention. The Lambeth Company is actively carrying out extensions and improvements in their works. At Molesey, where the new intake is situated, the construction of reservoirs has been commenced to contain 110 million to 120 million gallons of water, with pumping-engines to fill them to a level of 12 feet above the river. When full they will contain 10 to 12 days winter supply to the district, and during the months when floods prevail (by selecting the times of pumping when the river water is in the best condition) a good deal of flood water will be allowed to pass. Several days subsidence will thus be provided, and consequently an improvement in the water may be anticipated. The water from the reservoirs will run by gravitation through the new conduit to the filters at Ditton, which are in course of extension by the conversion of the two reservoirs there into filter-beds, which, when finished, will increase the present filtering surface by 70 per cent.

The Kent Company are now giving constant supply of water to about 1000 houses in their district, situated in the parishes of St. Mary's, Rotherhithe, and St. Paul's and St. Nicholas, Deptford.

The New River Company have provided additional steam power, mains, and high service reservoirs, which were required for the high pressure constant supply of the Metropolis Water Act, 1852, and after the passing of the Metropolis Water Act, 1871, they undertook the construction of a new service reservoir at Highgate (336 feet above Trinity high-water mark) as a further addition to their power of affording effective constant service. This reservoir is now finished. The company have in a number of cases afforded constant supply by means of stand-pipes, and they have recently agreed with a committee of the Corporation of the City of London to furnish constant supply at once to a large number of the houses of the poor within the City bounds, and are waiting the arrangements of the officers of the corporation in connexion therewith.

The East London Company, in accordance with their notice previously given to a special district of 6328 houses, turned on the constant supply on the 25th of March, not a single householder having made any preparation in compliance with the notice. The owners have since been compelled to amend their fittings, and the district is under rapid improvement. The large increase in the average daily delivery is due partly to this cause.

The Southwark and Vauxhall Company are constructing a reservoir at Nunhead, to contain 18 million gallons for high pressure constant supply.

The West Middlesex Company are giving constant supply to a number of houses on the application of the owners, who have provided fittings according to the Board of Trade Regulations of Aug. 10, 1872, and are fully prepared to extend the constant supply when called upon. This company is also constructing additional engine power at Hammersmith and at Hampton to ensure effective constant supply.

The Grand Junction Company are constructing a high service reservoir near Kilburn, to contain 6 million gallons for constant supply, and the work is now far advanced.

The Lambeth Company are giving constant supply by means of stand-pipes in a number of courts and alleys, and arrangements have been made to supply upwards of 5000 houses of this class. The alterations in fittings under the new Board of Trade rules and regulations are being gradually effected as occasion offers, and are carried out in all new buildings.

The following regulations made by the Board of Trade, dated Aug. 10, 1872, refer to future fittings required for constant service, and forbid the use of ferrules to restrict the supply:—

Regulation 12. "Every 'communication-pipe' for the conveyance of water to be supplied by the company into any premises shall have at or near its point of entrance into such premises, and if desired by the consumer within such premises, a sound and suitable stop-valve of the screw-down kind, with an area of waterway not less than that of a half-inch pipe, and not greater than that of the 'communication-pipe,' the size of the valve within these limits being at the option of the consumer."

"If placed in the ground, such 'stop-valve' shall be protected by a proper cover and 'guard-box.'"

Regulation 28. "Except with the written consent of the consumer, no cock, ferrule, joint, union, valve, or other fitting, in the course of any 'communication-pipe,' shall have a waterway of less area than that of the 'communication-pipe,' so that the waterway from the water in the district-pipe or other supply-pipe of the company up to and through the stop-valve prescribed by regulation No. 12, shall not in any part be of less area than that of the 'communication-pipe' itself, which pipe shall not be of less than a half-inch bore in all its course."

Regulation 33. "All existing fittings, which shall be sound and efficient, and are not required to be removed or altered under these regulations, shall be deemed to be prescribed fittings under the 'Metropolis Water Act, 1871.'"

If the precaution relative to waste-pipes, contained in the following clause of the Board of Trade Regulations, 1872, is carried out in its integrity, it will confer a great boon on the consumer, by preventing contamination from the gases generated by sewage, which otherwise are extremely liable to flow back into the cisterns and become absorbed by the water.

Regulation 14. "No overflow or waste-pipes other than a 'warning-pipe' shall be attached to any cistern supplied with water by the company, and every such overflow or waste-pipe existing at the time when these regulations come into operation shall be removed, or at the option of the consumer shall be converted into an efficient 'warning-pipe,' within two calendar months next after the company shall have given to the occupier of, or left at the premises in which such cistern is situate, a notice in writing requiring such alteration to be made."

The Act of 1871 provides power to compel the companies to give constant supply as and when the public authorities may see fit to move.

The water companies state that they have prepared their mains for constant supply, and they have now 900 miles of such mains continually charged with water ready for constant supply along their whole course.

It is anticipated that greater safety from fires would result from the constant supply, since it would enable the use of hydrants instead of fire-plugs, and thus more rapidly and effectively extinguish fires. Hydrants might now and for some time past have been substituted for fire-plugs, but they have not yet in any case been supplied.

The following are the returns of the Association of Medical Officers of Health relating to the composition and quality of the metropolitan waters, in May, 1873:—

Names of Water Companies.	Total Solid Matter per Gallon.	Oxygen required by Organic Matter, &c.	Nitrogen.		Hardness.	
			As Nitrates, &c.	As Ammonia.	Before Boiling.	After Boiling.
Thames Water Companies.	Grs.	Grs.	Grs.	Grs.	Degs.	Degs.
Grand Junction	18·93	0·051	0·115	0·002	14·4	3·6
West Middlesex	17·67	0·031	0·125	0·001	14·0	3·0
Southwark and Vauxhall	18·92	0·050	0·128	0·002	14·4	3·6
Chelsea	18·87	0·067	0·147	0·001	14·5	3·5
Lambeth	19·43	0·054	0·104	0·001	14·8	3·6
Other Companies.						
Kent	28·70	0·002	0·208	0·000	20·0	6·0
New River	17·77	0·025	0·131	0·000	14·0	3·0
East London	17·51	0·049	0·181	0·001	14·0	3·8

Note.—The amount of oxygen required to oxidize the organic matter, nitrites, &c., is determined by a standard solution of permanganate of potash acting for three hours; and in the case of the metropolitan waters the quantity of organic matter is about eight times the amount of oxygen required by it.

The water was found to be clear and nearly colourless in all cases but the following, when it was more or less turbid—namely, in those of the Lambeth, the Southwark and Vauxhall, the Chelsea, and the Grand Junction Companies. The average quantity of water supplied daily to the metropolis during the preceding month was, according to the returns of the water companies to the Association of Medical Officers of Health, 109,807,217 gallons; and the number of houses supplied was 503,127. This is at the rate of 33·2 gallons per head of the population daily. The last official return from Paris stated that the average daily supply per head of the population was 30·5 gallons; but this includes the water used for the public fountains, and for the ornamental waters in the Bois de Vincennes and the Bois de Boulogne. Hy. Letheby, M.B.

Dr. Whitmore's report on the composition of Thames companies and other waters as supplied in Marylebone:—

May, 1873.	Total Solid Matter in degrees or grains per Imperial gallon.		* Loss by incineration of Solid Matter in previous column.		Hardness before boiling in degrees.	Hardness after boiling in degrees.
	May, 1872. 0°	May, 1873. 0°	May, 1872. 0°	May, 1873. 0°	0°	0°
Distilled Water						
West Middlesex water	17·68	20·14	0·68	0·98	14·80	3·80
Grand Junction water	17·84	20·00	0·70	0·99	14·80	3·70

* The loss by incineration represents the amount of organic and other volatile matters contained in an Imperial gallon (70,000 grains) of water.

It will be seen from the above table that the total amount of solid matter, both in the West Middlesex and Grand Junction Company's water, was in excess by rather more than 2 grains of the quantity contained in them in the corresponding month of last year; the organic matter was also in excess to a trifling extent. The West Middlesex water was, as usual, perfectly clear, bright, and colourless; the Grand Junction water was also bright and clear.

The Registrar-General publishes the following returns furnished to him by the London water companies, of the average daily quantity of water supplied during the month of April, 1873:—According to their returns, 109,807,217 gallons, or 498,904 cubic mètres of water (equal to about as many *tuns* by measure, *tons* by weight), were supplied daily; or 218·2 gallons (99·2 decalitres), rather less than a *ton* by weight to each house, and 30·7 gallons (14·0 decalitres) to each person. According to returns of the London water companies made to the select committee on East London Water Bills (session 1867), it is estimated that, during the year 1866, about 82 per cent. of the total supply of water for all purposes was for domestic use; applying this proportion to the total quantity supplied daily in the month of April, 1873, it may be estimated that about 90,041,918 gallons were used for domestic purposes, or about 25·2 gallons per day for each inhabitant, against 24·6 in the corresponding month of last year. This proportion no doubt varies from month to month, but the Registrar-General has no means of giving a more exact estimate.

Companies.	Number of Houses, &c., supplied in April, 1872.	April, 1873.	Aver. Daily Supply of Water in Gallons* during April, 1872.	April, 1873.
Total supply	495,677	503,127	105,457,575	109,807,217
From Thames	231,001	235,539	56,112,083	57,857,844
,, Lea and other Sources	264,676	267,588	49,345,492	51,949,373
Thames.				
Chelsea	28,154	28,270	8,503,800	8,201,700
West Middlesex	43,232	44,565	9,474,786	9,019,458
Southwark and Vauxhall	78,823	79,194	16,418,726	17,784,636
Grand Junction	33,013	34,243	11,070,571	11,319,550
Lambeth	47,779	49,267	10,644,200	11,832,500
Lea and other Sources.				
New River	120,054	121,015	23,372,000	22,147,000
East London	103,513	104,637	19,404,000	23,707,900
Kent	41,109	41,936	6,569,492	6,094,473

* Including that for manufactures and for various purposes other than for domestic consumption.

Note.—The return for April, 1873, as compared with that for the corresponding month of 1872, shows an increase of 7450 houses, and of 4,349,642 gallons in the daily supply of water.

At the meeting of the Metropolitan Board of Works, on Friday last, the solicitor brought up a report giving the purport of the answer which Mr. Stansfeld, President of the Local Government Board, gave to Mr. Agar-Ellis on the subject of the Metropolitan Water Act, 1871, in the House of Commons. Mr. Phillips said from what he had heard of the president's answer it appeared to be damaging to the board, and he would, therefore, move that the matter should be referred to the Works Committee. The motion was seconded and approved. Mr. E. Dresser-Rogers stated that he had received a letter from one of his constituents, whom he knew to be a most respectable man, which he wished to place before the board. The Southwark and Vauxhall Water Company had lately built an enormous reservoir at the top of Nunhead, a part of the wall of which had given way a few days since; and he wished to know if the Board of Works could take steps to prevent the inhabitants from danger by securing in some way that the construction was safely carried out. He did not think the board could interfere in the matter, but he should be glad if the solicitor

would report upon the subject as to any power the board might possess. The communication was handed to the chairman, on the understanding that it should be reported upon at the next meeting.

Dr. Frankland, F.R.S., in his report for the month of May, states that all the metropolitan waters were clear when drawn from the mains, "except that delivered by the New River Company, which was slightly turbid from the presence of minute white floating films amongst which moving organisms were seen. This impurity was not due to imperfect filtration, but probably to the repairing of a main or reservoir." Taking the amount of organic impurity contained in a given quantity of the Kent Company's water as unity, the proportional amount in an equal volume of water supplied by each of the other metropolitan companies was:—New River, 1·5; West Middlesex, 2·6; Chelsea, 2·7; Southwark and Grand Junction, 2·8; Lambeth, 2·9; East London, 3·0. The river waters supplied to London have now assumed their summer character, and contain only about one-fourth as much organic matter as that which they held in solution during the winter months.

YORK GAS SUPPLY.

The Monthly Meeting of the City Council was held in the Guildhall on Monday, June 2—The Lord Mayor in the chair.

The Urban Sanitary Committee presented a report, from which it appeared that a communication from the directors of the gas company had been received, stating that, owing to the great increase in the price of coal and other items in gas manufacture, they were reluctantly compelled to advance the price of gas to 3s. 4d. per 1000 cubic feet. The annual charge for public lamps would, therefore, be increased, from the 1st of July next, to £2 19s. each. The directors trusted that the necessity for the increase might only be temporary. The town-clerk informed the committee that by the agreement with the gas company in 1866, it was provided that either party desirous of determining the same should give to the other party six months notice thereof prior to the 1st day of January in any year, and that in his opinion the company had no right to increase the charge for the public lamps at the time mentioned in the letter. The committee thereupon resolved that, without prejudice to any question as to the present competence of the gas company to make any increase whatever in the price of gas, either for public lighting or for private consumers, the town-clerk should be directed to call the attention of the company to the clause in the agreement between the company and the corporation, whereby six months notice was required to determine the same, and to inform the company that the committee was advised that the charge for the public lamps could not be raised until such agreement had been duly determined accordingly.

The Town Clerk said that since the committee last met a second communication had been received from the gas company, in reference to the public lighting of the city. The letter was written by Mr. W. H. Cobb, the solicitor of the company. It had not yet been laid before the committee, and was as follows:—

York, May 30, 1873.

Dear Sir,—I am requested by the directors of the gas company to acknowledge the receipt of your letter of the 21st inst., addressed to their secretary, which was laid before the board at their fortnightly meeting held yesterday, and in which you contend, on behalf of the corporation, that under the terms of their contract with the gas company, six calendar months notice, previous to the 1st of January, is required, before the gas company can raise the price of gas for the public lamps, as they propose to do, from £2 10s. 6d. (the price at present charged) to £2 19s. per lamp.

The directors wish me to draw your attention to the terms of the contract, dated the 8th of November, 1866, by which the corporation covenanted to pay to the company £3 1s. 6d. per lamp, until the contract should be put an end to by six calendar months notice in writing from either party to the other previous to the 1st of January in any year. No notice has been given to terminate this contract, and being a contract under seal, it cannot, as you are aware, be altered or varied by any verbal or written arrangement not under seal.

The directors are constrained to assume that in objecting to pay £2 19s. per lamp the corporation has overlooked the fact that the company has, for the past three years and upwards, been charging the corporation a less sum than they were entitled to under the terms of the contract. The price has been voluntarily reduced by the company three times—viz., from January, 1870, to £2 19s.; from January, 1871, to £2 15s. 6d.; and from January, 1872, to £2 10s. 6d. per lamp. These reductions were communicated to the corporation as soon as resolved upon in the month of August in each year previous to the reduction, and the corporation did not on any one occasion feel themselves bound to decline the reduction without first receiving a six months notice, expiring on the 1st of January, of the intended decrease. Had this notice been *required by the gas company* (and they were clearly entitled to require it under the terms of the contract), the effect would have been that the corporation would have lost the benefit of the reduction for twelve months in each case. Under these circumstances the directors are surprised that when the price is again raised, owing to the very large increase in the cost of coal and manufacture, to a sum still considerably below the full price—viz., £3 1s. 6d., which the company is entitled to charge under the contract—an objection is taken, and six months previous notice is required.

With regard to the legal question, the company has taken the opinion of Mr. Manisty, Q.C., who advises them that the contract, being by deed under seal, can only be determined, altered, or varied by deed under seal, or by a six months notice in writing under the terms of the contract; that the reductions in price were voluntary concessions on the part of the gas company, and that they did not constitute a new contract or an abandonment of the old one; and further, that the company can withdraw their existing concession, and insist upon payment of the contract price from the time of withdrawal.

As explained to you by the chairman at our interview yesterday, the directors of the company have no wish to enforce their strict legal rights, or to depart from that equitable and conciliatory policy which they have hitherto adopted in their dealings with the corporation, and it is with a view of giving the corporation an opportunity of more fully considering the matter with reference to the facts, law, and equity of the case that the chairman waited upon you yesterday, and that at your suggestion I write you this letter.

The proposed increase in price does not come into operation until the 1st of July, and I venture to hope that before the necessity arises for any further action on the part of the company, the corporation will see the propriety of withdrawing their objection. I trust that this letter will be received in the spirit in which it is written, and you will of course consider it to be without prejudice to any ulterior steps which the company may be compelled to take. (Signed) W. H. Cobb, Solicitor to the Gas Company.

J. Wilkinson, Esq., Town-Clerk, York.

Alderman Wade moved that the minutes of the committee be confirmed.

Mr. Crummack inquired whether the gas company, according to the terms of their Act of Parliament, had power to raise their present rates for gas.

The Town-Clerk, in reply, stated that it would be first advisable to take the opinion of counsel on the matter, and when that opinion was obtained they would be the better enabled to deal with the question than by entering into a discussion of it at that meeting. The letter from the solicitor to the gas company had only just come to hand, and it had not come under the attention of the committee. At present he thought it would be the best to acknowledge the receipt of the letter and the courtesy of the company, and take the opinion of counsel on the matter. He submitted that this would be the more suitable way of dealing with the subject at present.

Mr. Crummack said possibly that might be so, but, as far as he understood the Act, the gas company could not raise the price of their gas under any circumstances until their dividends fell below 10 per cent. It was certain that this would not be the case during the present year. He produced a copy of the company's Act, and asked the town-clerk to read the sections upon this particular point as to the amount of dividend, &c.

The Town-Clerk accordingly read the sections. The 119th section stated that "if the clear profits of the gas company, after payment of all costs, charges, and expenses, shall in any year amount to a larger sum than shall be sufficient to make distribution amongst the proprietors of the company of the dividends hereby authorized to be paid in respect of such share in the said undertaking, the excess beyond the sum which may be necessary for the purpose aforesaid shall from time to time be invested in Government or other securities, and the dividends and interest arising from such securities shall also be invested in the same or like securities, in order that the same may accumulate at compound interest, until the sum so formed shall amount to £5000, which fund shall form a contingent or reserved fund to answer any deficiency which may at any time happen in the amount of divisible profits of the company, or to meet any extraordinary claim or demand which may at any time arise against the company; and when such fund shall, by accumulation or otherwise, amount to the sum of £5000, the interest and dividends thereon shall no longer be invested, but shall be applied to any of the general purposes of the said undertaking, until the said contingent or reserved fund shall have been applied and exhausted, according to the provisions of the Act, in which case the same may be again raised and applied in the same manner as hereinbefore directed, and so *toties quoties* as often as occasion shall require, for the purposes hereinbefore mentioned." The 120th section enacts that "when and so soon as such fund shall, by accumulation or otherwise, amount to the sum of £5000, an account of the said contingent-fund, and of receipts, expenditure, and profits of the company, shall be laid before the justices assembled at the quarter sessions of the peace for the county or city of York, and be filed with the clerk of the peace of the said county; and the company shall also, if required by the justices, or by the accountant, or other person to be appointed as hereinafter mentioned, produce their books of account, and other books, bills, receipts, vouchers, and papers relating to the said undertaking." The 123rd section enacts that "if in any year after the passing of this Act the profits of the said undertaking divisible among the proprietors thereof shall not amount to the respective sums hereinbefore authorized to be divided amongst the several proprietors of shares in the said undertaking, such a sum of money may be taken from the contingent fund as, with the actual divisible profits of such year, will enable the company to make such respective dividends."

Mr. Crummack produced a batch of half-yearly balance-sheets of the gas company from 1860 up to the present time. From the last balance-sheet for the half year ending Dec. 31, 1872, he found that the cash in hand, &c., amounted to £19,129 2s. 10d. Deducting stock on hand, £3597 11s. 10d., and account owing, £1411 1s. 1d., the two sums making £5008 12s. 11d., which sum being taken away from the £19,129 2s. 10d., reduced the amount to £14,120 19s. 11d., and allowing for the payment of £4750 as the dividends for the half year, there remained a balance in hand of £9370 9s. 11d. The gas balance was therefore nearly double the sum of £5000; and, under these circumstances, he contended it was neither consistent nor legal to raise the price of gas as contemplated. It was perfectly clear that the company had no legal right to raise their prices until their dividends fell below 10 per cent. The clauses read confirmed the opinion he had expressed, that it was not legal to increase the gas-rate this half year.

The Town-Clerk also read over the statement of Mr. Crummack as to the affairs of the company at the end of last year.

Mr. J. Brown said as there was a contract in operation between the corporation and the gas company, and the sum charged by that contract was not to be exceeded, what necessity was there for a legal opinion being obtained at all? The gas company had lowered the price of gas to the city without giving any notice that they were going to do so, at three particular times, and this was not objected to as contrary to the terms of the contract. No point was raised as to the legal question. Was there, therefore, any good reason for objecting to the price being raised, when the company had previously, according to circumstances, lowered the price of gas and given the city the benefit of the reduction for some years? It was only fair for the gas company to raise the price within the limits of the contract, as it was not intended to exceed those limits. In his opinion it was unnecessary to ask counsel's opinion or to call upon the company to give six months notice. If the company ought to give the corporation six months notice, the corporation should have done the same to the company. They could not fairly do anything in the matter, taking all the facts together as to the contract.

Mr. Crummack said that the arguments of Mr. Brown did not go to the real question. It was a broad principle. The company by their Act of Parliament could not raise the price of gas so long as they were enabled to pay 10 per cent., and, in addition to this, with the amount of money they had now in hand they could not do it.

Mr. Charlton considered that the question was one which could be easily understood. The company and the corporation stood in the same position to each other as landlord and tenant. If a landlord of either houses or land resolved that he could afford to take a lower rent for his property, he could do so without giving any notice to his tenants; but if, on the other hand, he resolved to raise his rents, he would be unable to do so without giving six months notice thereof. That was the law of the land as regarded property, and it would be the same as regarded this particular question. The object of having six months notice named in the contract was that if the gas company did not deal fairly with the corporation the contract might be brought to an end, and the corporation would then erect works of their own. In his opinion they would ultimately have to erect gas-works if the company persisted in taking their present course, as it would have the tendency of forcing the council to supply the streets with gas. If the council had gas-works of their own there would be no more cost incurred to the city. The company had as yet experienced no loss at all, and he believed they would not. They were yet using coals at the old cheap rate, and would do so to the end of the present month. They had also been receiving double the price that they used to do for their coke, and they had been reaping other advantages. At the least they ought to have waited for six months before they sought to raise the price of gas, and first seen how the enhanced rates for coal affected them; but they proposed to raise the price of gas to the city and to private consumers without waiting to ascertain if there was really any necessity for so doing.

Mr. T. Turner inquired if Mr. Charlton was a shareholder in the gas company.

Alderman Weatherley: Yes.

Mr. T. Turner said that being the case he might be allowed to say a few words on the other side. The company had reduced the price of gas three different times, as he gathered from the letter of the company's solicitor. Although these reductions had been made from time to time for the benefit of the city, yet no six months notice had been given in any instance. The reductions were made at once. Mr. Crummack rushed into figures, and he was often very wrong in his calculations, which were most delusive indeed. A short time ago they went to a considerable expense in obtaining the opinion of an engineer, and the bill of costs was a good lump sum of money—a sum which he thought they had no right to take out of the city funds. He repeated that as three reductions in the price of gas had been made without six months notice, and the city enjoyed the benefit of such reduction, that it would be a shame if the council endeavoured to take an undue advantage of the company by demanding six months notice. If they took the advice of Mr. Crummack, who seemed to be the factotum in gas matters, they would have to rush into law.

Mr. Alderman Weatherley said he would reply to what Mr. Charlton had advanced and also Mr. Crummack. In the first place, he would deny the accuracy of the documents and the figures written in blue ink and produced by Mr. Crummack. He would put them aside at once as perfect nonsense. There was not a figure that he had put down that could for one moment be depended upon. The directors of the company had never had anything like such a sum in hand as Mr. Crummack had represented as the balance at disposal. The figures he had put forth were useless, his account was delusive, and it could hardly be seen how he put it together. He could only say in reply to his singular account that the company had made three distinct reductions in their charges for gas. According to the contract of 1866 the rate per lamp

was to be £3 1s. 6d.; but in Jan., 1870, the price was lowered to £2 19s.; in Jan., 1871, there was a second reduction to £2 15s. 6d.; and in Jan., 1872, a still further reduction to £2 10s. 6d. per lamp, all this being done by the company voluntarily without requiring any notice. There was, in his opinion, no legal question involved at all in the matter, inasmuch as the increased rate proposed was within the terms of the contract, the agreement being to light the city at £3 1s. 6d. per lamp. They would allow him to ask the council what the city got according to the contract. The company supplied the lamp-pillars and kept them in repair and proper condition. They also had to put the piping from the mains to the lamps, to repair the broken glass, as well as keep in order the bracket lamps. In addition to all this, the company employed the men who had to light the lamps and put them out. With respect to the reductions from the contract of £3 1s. 6d., he would say that the first of these reductions was to £2 19s. per lamp, and the company's present notice was only to go back again to that reduced scale of £2 19s., which was considerably below the terms of the original agreement. The council ought to remember when the price was first reduced to £2 19s. from £3 1s. 6d. that the company were paying very much less for their coal than they would have to do shortly. Under these circumstances the company were fully justified, and more than justified, in charging the rate which they proposed from July 1 next. They would have been justified in making even a further advance, seeing the very high price of coals, which was now more than double what it used to be, the advance in the price of labour to the extent of 25 per cent., with double the cost for piping, and the general enhanced rate at which gas could be manufactured, all tended to prove that the company had no alternative than that of making the advance. Notwithstanding what Mr. Crummack and Mr. Charlton had said, the company had always been ready to meet the city honourably and fairly, and to supply good lighting for the streets to protect life and property. He would call the attention of the council to the fact that £12 was paid for gas for three public clocks in the city, and this was merely for the gas without any extras.

Alderman DOVE: Yes, but those lights burn night and day, you know.

Alderman WEATHERLEY, in answer to this remark, said that the lights were turned down very low indeed in the daytime, and £4 was being paid for a single light, whilst at the time the price for a lamp was only £2 10s. 6d.

Alderman DOVE: The clocks have double and treble lights.

Alderman WEATHERLEY still contended that the street-lamps were lighted at a cheaper rate, and stated that, if the corporation had the gas in their own hands they would not be enabled to supply the public lighting of the city at a less cost than the gas company were now doing. The directors of the company, after a thorough investigation and inquiry into the whole subject, found that the proposed increase in the price of gas was compulsory.

Mr. SHARP considered it desirable to have counsel's opinion as to whether the increase in the price of gas was legal according to the contract, as the question was one which not only affected the council but the citizens at large.

Alderman HARGROVE said they did not want counsel's opinion as to the precise amount of advance in the price of gas, assuming that they were right in making the advance. It was a question of fair play. The council took the advantage when the company reduced the charges for gas on three separate occasions, and the city did not then require six months notice. Now that the company were raising the price per lamp to £2 19s., the council reqnired six months notice. He considered that it was only fair play to submit to the advance, because at that very moment the company could compel them to pay £3 1s. 6d. per lamp under the contract.

Alderman DOVE: It is not a question of law so much as a question of honour.

Alderman HARGROVE: Three times over we have had the benefit of a reduction, and now an objection is made to £2 19s. Under the existing contract the company is entitled to receive from us £3 1s. 6d. per lamp. It is right to keep down charges as far as possible, but fair play is a jewel which we ought to observe. As a question of honour we must pay the advanced price.

Alderman MARCH considered that it was a great pity that the discussion, or rather conversation, had taken place. At the present time they were not in a position to go into the question and fully discuss it, as it was not ripe for discussion. Seeing that the gas company had taken legal advice in the matter, they ought also to do the same. He moved a resolution that the town-clerk acknowledge the receipt of Mr. Cobb's letter, and also be authorized to take the opinion of counsel upon the points raised in such letter.

Mr. CRUMMACK seconded the motion.

Alderman MARCH said that it would be far better to withhold their views on the question at present, and let it be fully and properly discussed at the proper time. He felt sure that no member of the council was desirous of doing anything which might be looked upon as discreditable to the corporation, seeing that the directors had already reduced the price of gas three times. Now that the company found it necessary to raise the rates, the council and the city ought not to endeavour to take any undue advantage, knowing the benefits which had previously been received.

Mr. CRUMMACK: In the abstract that is right.

Alderman WEATHERLEY: But your figures are not right.

Alderman DOVE thought that it was perfectly unnecessary to take legal advice in the matter, as they had an agreement or contract which stated the amount which had to be paid for gas. The company in their liberality had lowered the price of their gas three times, and it was not now sought to increase the price beyond the terms of the contract. Under all the circumstances of the case, and seeing that previously reductions had been made, he thought that the council was bound to pay the increased price asked, without requiring six months notice. The question was one purely a matter of business, and he hoped that they would have nothing to do with the lawyers by asking for their opinions.

Mr. CONING said it was evident the question at issue was deemed to be one of some importance by the gas company, who had considered it necessary on their part to obtain counsel's opinion, and therefore he thought that the council ought also to take the opinion of counsel. He was quite in favour of the motion of Alderman March.

Alderman ROWNTREE trusted that in dealing with the question the council would not avail itself of any legal quibbles, but deal with the whole matter fairly and honourably, and this he believed they were prepared to do. With regard to the issue raised by Mr. Crummack that the company could not raise the price of their gas as long as they paid 10 per cent. dividend, it was clear that if this was the case, whatever might be the agreement price, the rate could not be raised. That admitted of no dispute if Mr. Crummack was right.

Mr. HODGSON moved as an amendment that the question be referred back to the committee.

Mr. SCOTT seconded the amendment.

The TOWN-CLERK, in answer to a question from Alderman Rowntree, said he considered it necessary to have counsel's opinion. The matter was one of importance. They might read the contract as if £2 10s. 6d. were inserted in it, and not £3 1s. 6d., the present price charged, and refuse to consent to any advance until the agreement was determined. The special conditions of the agreement would then remain the same as they did before the reduction of price took place. That was the question raised by the resolution of the committee.

Mr. BROWNE considered that it would be very shabby indeed of the council to resist the advance in price when they had so readily availed themselves of the reductions as they were offered, whilst the company were not obliged to concede them. It would be most ungenerous now to treat the company in the way that some parties seemed disposed to do, knowing as the council did that the city had received the benefit of the low price of coals by the moderate rate at which they paid for gas. He thought the council ought to treat the company in a more generous manner than that of resisting the advance. If they went over all England they could not find any town that was provided with cheaper gas than York, both as regarded the private consumer and the lighting of the streets.

Mr. THOMAS inquired, in the event of the counsel's opinion being adverse to the corporation, would they go into litigation.

The LORD MAYOR: That is a point which cannot be answered at present. We cannot go into it now.

Mr. CONING asked if the members of the council present, who were shareholders in the gas company, could vote upon the question.

The TOWN-CLERK, in reply, considered that they were entitled to vote. The motion was to take counsel's opinion upon merely a point of law, and he took it that it was not such a question as to preclude members of the council connected with the gas company from voting upon it.

The amendment was put first, namely, that the question be referred back to the committee, when 13 voted in its favour, and 13 "on the contrary." The Lord Mayor gave the casting vote against the amendment.

The original motion for taking counsel's opinion was next submitted, and 14 hands were held up in its favour. The contrary was not put, it being assumed that the resolution was carried, inasmuch as in the previous case 13 was a tie. Several members of the council were neutral.

Mr. J. BROWN doubted whether the decision was strictly legal, as it was not carried by a majority of the members of council present.

The TOWN-CLERK intimated that as the motion was adopted he should take counsel's opinion for his own satisfaction.

BRADFORD (CORPORATION) GAS SUPPLY.

On Tuesday last, June 10, the monthly meeting of the Bradford Town Council was held. Alderman DAWSON presiding.

Alderman SCOTT moved "That in accordance with the recommendation of the Gas Supply Committee, the council, do increase the price of gas from 3s. to 3s. 6d. per 1000 cubic feet." He said he believed that on this occasion the council would pass the resolution, and that the application which he made on behalf of the Gas Supply Committee would be successful. In that belief he would not trouble them with any remarks on the subject. The question would come home to the pockets of every one of them when they knew that during the last twelve months their coal bills had doubled. Looking at this fact, they would not grumble at the small increase which it was proposed to make in the price of gas. The council in this matter occupied the position of a trading company, and they ought to carry on their business with as much secrecy as was compatible with the public interest, and he would, therefore, unless the council required it, abstain from going into that question. He would only say that if they declined to grant his application, and the price of gas was to remain at 3s. per 1000 feet, they would lose considerably by the manufacture. The price which it was proposed to charge —3s. 6d.—was still much lower than was charged in other towns in the country. He could give figures in support of this statement, but it would hardly be fair to do so unless he was prepared to give at the same time the quality of the gas supplied and the amount of discounts allowed. He would, however, say that he believed that in Bradford as much discount was allowed to the large consumer as in any other town.

Mr. WAUD seconded the resolution. He had gone carefully into the question of cost, and he was convinced that 3s. 6d. per 1000 feet was as little as the corporation could afford to charge for the gas. He had opposed the increase on a previous occasion, but he now saw that some increase was necessary, and he gladly seconded the resolution.

Alderman BRAYSHAW questioned the statement made by Alderman Scott as to the price of coal having doubled within twelve months.

Mr. BARBER asked the amount of discount allowed to large consumers, and the total deduction on this account on the annual production of gas. He thought it was unfair to allow these discounts at the same time that an increase in the price was proposed.

Alderman SCOTT, in answer to Mr. Barber, said that the amount of discount varied from 2½ to 20 per cent. to the largest consumers. In allowing these discounts the committee were only carrying out the policy adopted by the gas company previous to the works passing into the hands of the corporation, and they were also following the example of the corporation in the matter of water. In that case the large consumers of water received even more discount than the large consumers of gas. The question had been considered in the committee, and it had been felt that they could not alter the arrangements. The total deductions would amount to about 5 per cent. on the total production.

The resolution was then carried with one dissentient.

LEEDS NEW WATER-WORKS.

The following report on the progress of these works has just been laid before the Town Council by the Water-Works Committee:—

In accordance with the resolution of the council, dated Jan. 1, 1873, the Water-Works Committee present the following general statement of the work done and expenditure incurred up to April 30, 1873, in carrying out the new works for the supply of water to Leeds from the river Washburn:—1. The supply from Washburn Foot to the pumping-engines at Arthington. There has been nothing done upon this branch of the work since the committee's report in September, 1871, at which period the 27-inch conduit-pipes had been laid, the reservoir at Arthington altered, and a temporary dam made at Washburn Foot, so as to afford a partial supply of Washburn water to the pumping-engines. The amount expended for this purpose has been £10,609. 2. The Gravitation mains. For this work nearly 16 miles of 30-inch pipes have been delivered, of which about 15¼ miles have been laid in the ground, at a cost of £76,924. The total length that will have to be laid is about 18¼ miles. 3. The Lindley Wood reservoir. The puddle trench is filled up with puddle to the height shown on a diagram presented herewith. About 35,000 cubic yards of tempered clay have been used for this purpose. About 3270 cubic yards of brickwork have been executed in the foundations for the two culverts, which have been built to the height shown on the diagram. The river Washburn has been diverted through the southern culvert, and the northern culvert will be finished so as to take its share of the flood waters in a few days. The temporary wooden shoot placed to convey the river across the puddle trench is removed. The temporary pumping-engines that were required to keep the trench dry during its progress are stopped. The upper part of the byewash has been partially excavated, and the greater portion of the stone required for the masonry lining is quarried and dressed. The main embankment has been raised to a height of about 15 feet. The Lippers Ford viaduct is so far completed that it is in use by the public. The boundary wall round the reservoir is in progress, about ½ mile being completed out of 3¾ miles intended. The total amount expended upon the Lindley Wood reservoir has been £121,838, of which £63,927 has been expended upon extra works not contemplated originally. 4. The Swinsty reservoir. The puddle trench has been excavated to its full depth throughout, excepting a short piece at the west end, and has been filled up with puddle to the height shown on the other diagram submitted herewith. About 14,500 cubic yards of tempered clay have thus been put into place. An unexpected difficulty was met with in excavating the trench in consequence of the existence of a deep fault in the shale, which had to be bottomed and filled with puddle as shown on the diagram. The main embankment has been raised to a height averaging about 9 feet. The large tunnel has been proceeded with night and day, and about 316 lineal yards have been completed out of a total length of 526 yards intended. The masonary of the inlet and outlet faces of the tunnel is in progress, and about half finished. The excavation for the byewash is in progress, and nearly one-third is finished. The total sum expended on the Swinsty reservoir has been £61,929. 5. The Fewston reservoir. No further progress has been made with this work since the committee's report in September, 1871, as the committee subsequently found that a very considerable economy would arise by delaying it until the plant and materials in use at the other reservoirs were at liberty. Finally. The total expenditure upon the Washburn supply up to April 30, 1873, has been as follows:—Act of Parliament, purchase of lands, compensations, surveyors and engineers charges, &c., £131,993; Washburn Foot supply, £10,609; gravitation mains, £76,924; Lindley Wood reservoir, £121,838; Swinsty reservoir, £61,929; Fewston reservoir, £1720; total, £405,013.

Dated May 9, 1873.

STAFFORDSHIRE POTTERIES WATER-WORKS COMPANY.

The Annual Meeting of this Company was held at the Company's Office, Hanley, on the 30th ult.—Mr. JOSEPH ALCOCK, in the chair.

In presenting to you the accompanying statement of accounts, your directors have to express their regret that owing to the extraordinary and exceptional expenditure caused by the heavy law expenses the company have been put to, and the increased price of fuel for the pumping-stations, they are not in a position to recommend a dividend of more than 4½ per cent. (free of income-tax), and payable on the 25th day of June next, being 4½ per cent. on the year. The gross rents for the year ending the 25th of March last, show an increase of £658 as compared with the previous year, and the statement of accounts annexed to this report shows a balance amounting to £3878 14s. 8d., out of which it is proposed to pay the dividend, which which will absorb the sum of £3669 15s., leaving a balance of £208 19s. 8d. to be carried to the next account. At the last annual meeting we reported that a scheme was in hand by which we hoped to obtain an extra supply of water for the rapidly increasing population; the carrying out of this scheme has, however, been impeded by the long delay in obtaining possession of the land, but this has now been arranged, and two acres of land (part of Cheddleton Park Farm) have been purchased from the Ecclesiastical Commissioners, on which your directors intend sinking and erecting an additional pumping-station, and they hope by this means to obtain an entirely independent supply of water without affecting any existing rights. The house fittings within the districts supplied with water are undergoing a vigilant inspection for the purpose of securing a uniform distribution of the supply; Hanley, Shelton, and Northwood have been inspected, and a large portion of the fittings were found very defective; these have been either renewed or repaired by the consumers, and a considerable amount of waste prevented. The result of this inspection will be to reduce the present large consumption in the lower portions of the town, and increase the pressure throughout the district. Since the issue of our last report it is with great regret we refer to the lamented death of our late chairman, Mr. Thomas Keeling, and also that of the late Mr. Joseph Bull, one of your directors. We have elected Mr. Joseph Alcock to succeed Mr. Keeling as chairman, and Mr. Benjamin Boothroyd to succeed Mr. Bull. The directors who go out this year by rotation are Edmund T. W. Wood, Colin Minton Campbell, William Brownfield, and John Bill, Esquires, but being eligible for re-election, they offer themselves accordingly.

The statement of accounts showed that during the year ended Lady-day the directors had expended on capital account, £726 16s. 7d., including Titteswortb reservoir, £46 14s.; Wall Grange works, £9 19s. 8d.; purchase of land at Penkhull, for new reservoir, £125; pipes, £220 10s. 4d.; pipe laying, £211 17s. 2d.; team work, £14 10s. 4d.; compensation, £31 6s. 9d.; new meter, £5 18s. 6d.; printing, advertising, &c., £23 12s. 3d. bankers interest and commission, £14 3s. 8d.; sundries, £233s. 11d. The total expended on capital account from the commencement of the operations of the company is £221,968 3s. 4d., the receipts on capital account being £223,745 3s. 7d. The water-rents for the past year amounted to £17,354 6s. 4d.

The CHAIRMAN, in moving the adoption of the report, alluded to the losses sustained by the deaths of two directors, and with reference to the results of the operations of the company during the year, he regretted that the dividend was not larger, but it was caused by exceptional circumstances. There had been unfortunate litigation between the company and Miss Clews, of Leek, which had resulted in their having to pay a large sum for costs, and he regretted to say that the matter was still unsettled; but as negotiations were still going forward, it would perhaps be well not to say much upon the subject at present, as it might prejudice their negotiations. The directors had done everything to conciliate Miss Clews, and to remove the grievance of which she complained, without getting anything satisfactory from her; they consequently felt it better to have a judicial decision, and the result was that they were mulcted in costs which amounted to a considerable sum. He next referred to the scheme they had in hand for increasing the supply of water. They had purchased two acres of land from the Ecclesiastical Commissioners with the view of sinking a shaft there; and if they succeeded in finding water they would not interfere with any existing rights, which was not to be desired. They had been very much troubled by the owners of the mill on the one hand, and those of the dye-works on the other. This scheme would involve a considerable outlay. The result of the sinking at the mill had not turned out so successful as expected, and consequently they were obliged to look out elsewhere. This was a subject of great anxiety to the directors, as they were anxious not only to protect the interests of the shareholders but also to give the public a better supply. He could not, however, disguise from them the fact that the matter was attended with considerable difficulty. They had vested interests to look to and to guard against so that they might not encroach upon the rights of others. They would leave no stone unturned to secure the ends in view. There had been also a revision of the house fittings throughout the district, by which it was hoped that considerable saving in the waste of water would be effected. They had suffered a great deal from that cause; and it had been estimated that one quarter of the water supplied had been wasted; and they had had instances before them in which taps had been kept running for two months continually. He was sorry to say that the magistrates did not look upon that offence in the way they ought to do. They treated it as a most trifling one, and would not fine more than from one shilling to ten shillings. In Manchester the magistrates fined for such offences at least 20s.; but he was sorry to say that their magistrates did not act upon that plan; and the consequence was that they had great difficulty in checking the waste. If the consumers would only consider that they were as much interested in preventing the waste as the company were, they would do their best to prevent it. It was a most grievous thing that water—and such beautiful water as it was—should be wasted; therefore he hoped the shareholders would assist the directors in counteracting that tendency.

Mr. BAKER seconded the motion. He said there was one remark made by the chairman which, he thought, deserved notice, and that was, that in consequence of the great necessity for water in the district, they should certainly protect the company in preventing the frightful waste. He hoped that the magistrates, who might see the report, would individually and collectively endeavour to support the measure. To a very large extent the company was at the mercy of the public, and it was impossible to watch every case. He hoped that next year they would have a much more favourable report. He must say that he for one did not consider it a satisfactory one; but he supposed that under the circumstances it was the best that could be offered to them.

The adoption of the report and statement of accounts was carried unanimously.

Mr. WALKER proposed—"That on the recommendation of the directors a dividend of 4½ per cent., free of income-tax, for the half year ending the 25th of March last, on 32,200 fully paid-up shares, and also a dividend of 4½ per cent., free of income-tax, for the three months ending the 25th of March last, on 4200 new shares, upon which £1 per share had been called up, be declared, and that the same be payable by dividend warrants on and after the 25th day of June next." He could deeply sympathize with the directors that they were not in a position to pay 6 per cent. He was satisfied that it was no fault of their own, for they had suffered far more than they as shareholders did, since the board held a very great amount of shares. When they came to look at the unfortunate law matter, and the price of coals, it was not at all surprising that they had had a little reverse. They might, however, look forward to brighter times as the increased rate ought to make a considerable difference in the profits of the company. He thought no reasonable person would object to paying an increased rate.

Mr. ADAMS seconded the motion, which was carried.

The retiring directors and auditor were reappointed, and the proceedings closed with the usual votes of thanks.

SELKIRK GAS-WORKS EXTENSION.—The directors of the Selkirk Gaslight Company have just entered into contracts for the erection of such additions to the gas-works as will increase them to three times their present size. The extensions, which are expected to be completed in October, will cost about £5000. The present price of gas to consumers is 5s. per 1000 feet.—*Scotsman.*

SUNDAY LABOUR IN GAS-WORKS.

The following circular letter has been issued by the Lord's Day Observance Society:—

Gas Manufacture on the Lord's Day.

My dear Sir,—I avail myself of the meeting of the Gas Managers Association in Edinburgh, which affords opportunities for consultation on matters affecting gas production and the interests of those who are engaged therein, to call your attention afresh to the changes which have been steadily made in the direction of diminished work on the Lord's Day; in the hope that you may be encouraged to lose no opportunity of reducing the Sunday work still lower, and thus promote the due observance of the Lord's Day among the labouring classes of the land.

The diminution of Sunday carbonising, during the past four years, has been very considerable.

Some of the largest works in London have rested for twelve hours every Sunday, summer and winter, for some time—one for three winters; and the works resting for the twelve hours are increasing in number.

The only works in London not included in the great strike of last autumn were the three in which the twelve hours rest had prevailed for some time. This may be accepted as proof that the Sunday rest had told satisfactorily on the men, making them more dependable and trustworthy.

Since the strike, and in part as a consequence of the strike, other works have adopted the twelve hours rest, and the largest gas companies in the metropolis have ordered it to be introduced at their works.

It may be safely asserted that considerably more than half the gas stokers in London have now a full 24 hours rest weekly—some from six on Saturday evening to six on Sunday evening; and the others from six a.m. on Sunday to six a.m. on Monday.

We have taken considerable pains to learn the result of these changes on the men, and know that they are exceedingly good in several ways, and that they have not led to increased drinking or other evils.

May I beg that you will endeavour in every way to aid this very useful effort, as well for your own sake as for the benefit of the men in your employ?

This committee will always thankfully receive information on the subject, and also donations or subscriptions to their funds, which are expended in working this and kindred operations. (Signed) JOHN GRITTON.

20, *John Street, Adelphi, London, W.C., June* 2, 1873.

ON THE ACTION OF WATER ON LEAD.

By Sir ROBERT CHRISTISON, Bart.

The most general results of the author's former inquiries are—1. That the purest waters act the most powerfully on lead, corroding it, and forming a carbonate of peculiar and uniform composition. 2. That all salts impede this action, and many prevent it altogether, some of them when in extremely minute proportions. 3. That the proportion of each salt required to prevent action is nearly in the inverse ratio of the solubility of the compound which its acid forms with the oxide of lead.

The effect of certain inorganic and organic ingredients of water in modifying the preservative power of the salts the author did not investigate. This has been made the subject of numerous inquiries and observations by others, chiefly, however, of a desultory nature, some of them much too succinctly described, and some, also, of questionable accuracy.

It has been denied that water acts by reason and in the ratio of its purity; and it has even been alleged that distilled water itself does not act if really quite pure. The author has, however, invariably found the reverse to be the case, and can assign no other explanation of these statements, except some error in manipulation. For example, a very pure spring water was sent to him from the south of England, with the assurance that it had been found incapable of attacking lead; but, on making trial of it, he found it to act with an energy not inferior to that of distilled water.

It has also been stated that ordinary distilled water is apt to contain a trace of nitric or nitrous acid, from nitrates incidentally present in the water subjected to distillation; and that such water, if distilled after the addition of a little potash to fix the acid thoroughly, yields a distillate which has no action upon lead. But when the author prepared distilled water in this way, with great care to prevent the access of impurities from other sources, the only result was that the action was even stronger than that of the ordinary distilled water of the laboratory, and greater, indeed, than he had ever before observed.

An interesting statement has been made by Dr. Nevins, to the effect that some salts appear to allow of a certain action going on when they are present in water largely, although their influence when they exist in very small quantities is to act as preventives. This result the author has sometimes obtained, and has found the action such as might prove dangerous. But its limit requires to be defined; and there is reason to suppose that the proportion required to *permit* action will be found to be greater than is ever likely to occur in the instance of waters applicable to household use.

It has also been said, but in general terms and without experimental proof, that the presence of carbonate of soda, even in a hard water, takes away the preventive influence of the other salts, and enables the water to dissolve lead. There appears to be some foundation for this statement; but here, too, it is necessary to fix what is the limit to such influence before its importance can be valued. Moreover, as bicarbonate of soda appears to have no such effect, and this is the usual form of the carbonate in natural waters, the practical importance of the fact is inconsiderable.

The corrosive action of water upon lead has often been confounded with other causes of corrosion, and the water has borne the blame. Thus the true action has been confounded with the corrosive action of potent agents accidentally coming in contact with the metal in the presence of water, as, for example, when a lead pipe has been led through fresh mortar, which is frequently or permanently kept moist, or when lumps of fresh mortar have been allowed to fall upon the bottom of a lead cistern.

The true or simple action of water has not unfrequently been confounded also with the effects of galvanic action. Thus, if a lead pipe or cistern be soldered with pewter solder and not with lead, erosion takes place near the line of junction of the solder with the lead. The presence of bars of other metals crossing lead, or bits of them lying on it, will also develop the same action; and some facts seem to point to the same property being possessed in a minor degree by some stony and earthy substances. This observation may explain the local erosion sometimes observed in cisterns containing hard water; since, if galvanic action be excited, it will be increased by the fact of saline matter existing more largely in these waters than in soft or comparatively pure water.

Lastly, some observers have contradicted former statements, because under certain circumstances, which led them to anticipate no action, they nevertheless found lead in water, but only in extremely minute and unimportant proportion. The test for lead, hydrosulphuric acid, when employed in the way now usually practised is so delicate as to detect that metal when dissolved in ten million parts of water, or even more. Facts, however, warrant the conclusion that the impregnation must amount to at least ten times this quantity before water can act injuriously on man, however long it may be used.—*Iron.*

DEWSBURY AND BATLEY CORPORATIONS GAS BILL.—A largely attended public meeting of the ratepayers of Batley was held in the Market Field, on Saturday, June 7. It had been called by the mayor in order to test the feeling of the inhabitants in regard to a petition that has been lodged in the House of Lords by a few of the millowners of Dewsbury and Batley, against the gas bill of the Dewsbury and Batley Corporations now before Parliament, on the ground that the maximum price fixed for gas (5s. per 1000 feet) will be too high. Several speeches were delivered expressing confidence in the corporation, and approving of what they had done in regard to the gas bill, and a resolution was passed, stating that in the opinion of the meeting 5s. was not too much as a maximum price, and pledging the meeting to support the council in carrying the gas bill to a successful issue.

BRITISH ASSOCIATION OF GAS MANAGERS.

The Tenth Annual General Meeting of this Association was held in the City of Edinburgh during the past week, conjointly with the Twelfth Annual General Meeting of the North British Association of Gas Managers. In anticipation of these gatherings, a number of gentlemen in Scotland connected with the coal trade and the supply of fire-clay goods, gas-works apparatus, &c., formed themselves into a committee, for the purpose of raising funds and making the necessary arrangements to give the members of these associations a most hospitable reception.

The following are the firms and gentlemen by whom the entertainments were provided:—Messrs. R. Laidlaw and Sons, Glasgow and Edinburgh; The Haywood Gas Coal Company; The Nitshill and Lesmahagow Coal Company; James M'Kelvie, Edinburgh; William Fraser, Inverkeithing; James Davidson, Newbattle Colliery; Henry Balfour and Co., Durie Foundry, Leven; Shotts Iron Company; J. and W. Romans, Forth Street, Edinburgh; George Wilson and Co., Kinnal Iron-Works; W. and B. Cowan, Edinburgh; Lochgelly Iron Company; James Milne and Son, Edinburgh; Pirnie Coal Company, Leven, Fife; Garnkirk Fire-Clay Company; Lanemark Coal Company, New Cumnock; D. Bruce Peebles and Co., Edinburgh; Monkland Iron and Steel Company; John M'Donald, Kirkwood Colliery, Glasgow; La Cour and Watson, Leith; James Darling, Blackhall Colliery Works; James Miller, Son, and Co., Glasgow; Andrew and James Stewart, Clyde Tube-Works, Glasgow; Alexander Thornton, Glasgow; Thomas Edington and Son, Glasgow; Hanna, Donald, and Wilson, Paisley; Darling and Co., Cleugh Colliery; Fullerton, Son, and Co., Edinburgh; Alder and Mackay, Edinburgh; Gray and Paul, Wilsontown; Cowdenbeath Coal Company; D. Y. Stewart and Co., Glasgow; Lesmahagow and Longlee Coal Company; Dunn Brothers, Glasgow; Capeldrae and Lochore Coal Company; Henry Caddell and Co., Grange; Young and Co., Glasgow; Wemyss Colliery; David Grant and Co., Edinburgh; Austine and Co., Glasgow; Hamilton, M'Cullock, and Co., Glasgow; R. C. Smith, Leith Walk, Edinburgh; R. and J. Gray, Porthead Colliery; Geo. Glover and Co., Glasgow; Galbraith, Reid, and Co., Glasgow; D. C. Mudie, Panmuir Foundry, Edinburgh; Armstrong and Hogg, Edinburgh; R. Maclaren and Co., Eglinton Foundry, Glasgow.

The result of their generous endeavours and their wisely-directed movements was to give quite a festive character to the events of the past week, and at the close of the proceedings on Thursday night, the very hearty manner in which the visitors expressed their satisfaction and delight at the entertainment they had received must have convinced the committee that their liberality was most fully appreciated. We have not yet received a report of the proceedings at the meeting of the North British Association, but hope to give them in our next. The attendance of members of the British Association throughout the whole of the meetings was unusually large, and the interest in the papers read, and the discussions thereon, was well sustained to the close.

TUESDAY, JUNE 10.

The business proceedings commenced this morning, at the Queen Street Hall —the PRESIDENT (A. Angus Croll, Esq., A.I.C.E.) taking the chair at eleven o'clock.

The minutes of the last general meeting, and the statement of accounts for the past year, which had been previously printed and circulated among the members, were taken as read, and adopted.

The SECRETARY (Mr. W. H. Bennett) read the list of applications for membership, as follows:—

ORDINARY MEMBERS.

Alsop, S.	Pinxton, near Alfreton.
Anderson, J.	Ceará, Brazil.
Armitage, C.	Darlington.
Bailey, G. D.	Pimlico.
Broadhead, J.	Grimsby.
Brown, C.	Wells, Somerset.
Carter, T.	London.
Coles, H. A.	Todmorden.
Church, Jabez, jun.	Westminster.
Darwin, C. B.	Maryport.
Douglas, D.	Chesterfield.
Dover, J. W.	Princes Risborough.
Drimmee, G.	Holywood.
Earle, N.	Dover.
Earnshaw, J.	Ashton-under-Lyne.
Edwards, A. J.	Taunton.
Ferguson, W.	Pimlico.
Forbes, J.	Denby Dale.
Fuller, T. C.	Ramsgate.
Furnivall, G. S.	Bradley Green.
Graham, D. A.	Stalybridge.
Greenaway, J.	Egham.
Guyatt, T.	(Ceará Gas Company), London.
Hamer, T.	Chorley.
Hammond, J.	Bagnor.
Hardy, W.	Ely.
Harkewitz, H.	Southbank, Yorks.
Harrison, J. P.	Topsham.
Hart, W.	Wakefield.
Hartley, C. L.	Blackburn.
Hatch, H.	Woolton.
Hathaway, H.	North Shields.
Hickling, L.	Calcutta.
Hill, J. H.	Huyton and Roby.
Holmes, T.	Pernambuco.
Howell, E.	Yeovil.
Key, W.	Dumbarton.
Kimperley, M. J.	Normanton.
Lawton, R.	Macclesfield.
Livesey, F.	(South Metroplitan Gas Company), London.
McCrae, E. M.	Dundee.
McPherson, A.	Kirkcaldy.
Meade, A.	Chelmsford.
Mildred, M.	Southwark.
Parks, T.	Bristol.
Pazzini, J.	Vienna.
Phillips, E. E.	High Wycombe.
Pritchard, F.	St. Helens.
Reid, J.	Edinburgh.
Richards, W.	Brixton.
Riley, J.	Brighouse.
Salisbury, E. H.	London.
Steinacher, J. E.	St. John's, Porto Rico.
Stevenson, G. E.	Aberdare.
Stevenson, J. S.	Dublin.
Tayler, J.	Fareham.
Taylor, J.	Oldham.
Thomas, A.	Alton.
Thomas, A.	Farnley.
Thomas, R. P.	Ware.
Tolosa, P.	Porto Rico.
Waters, G. R.	Portland.
Wilkinson, T.	Drighlington.

It was unanimously resolved—"That the gentlemen whose names have now been read be elected ordinary members of the association."

The SECRETARY read the names of the following gentlemen who had applied to be admitted extra-ordinary members of the association:—

EXTRA-ORDINARY MEMBERS.

Ashmore, W.	Hope Iron-Works, Stockton-on-Tees.
Cowan, W.	Buccleuch Street Works, Edinburgh.
Vickary, C. J.	Exeter.

These gentlemen were unanimously elected extra-ordinary members.

Messrs. Brown and Frith were appointed scrutineers of the votes for the election of committee and officers for the ensuing year.

The PRESIDENT then delivered the following

INAUGURAL ADDRESS.

Gentlemen,—The growing interest which is being taken by the members of the association in its proceedings and objects cannot but afford a lively satisfaction to all of us, and the more so when it is considered that, in proportion as the general body of gas engineers in the kingdom unitedly combine as a compact and harmonious organization, not only will their professional interests be increasingly promoted and protected, but the public at large will the more readily recognize and respect the usefulness of the association.

The association was started in 1863, the preliminary meeting being held in December of that year, when about 40 gentlemen were enrolled as members. Last year we added to our list 63 ordinary and 8 extraordinary members, making the total number 425. To-day we have an increase to our ranks of ordinary and extraordinary members, so that in this, the tenth year of our existence, we have acquired something like 475 members, a number which, considering the short time the society has been established, and the comparatively limited class from which it is composed, cannot fail to be looked upon as an eminent success, and one well worthy of the promoters. Financially too we are progressing very satisfactorily. For the first year or two after the association commenced its operations it was scarcely able to meet its liabilities, but now, I am happy to say, after incurring a heavier expenditure last year than in any preceding one, we had a surplus of receipts over expenses of nearly £80, and have a balance of upwards of £390, part of which has, by desire of the committee, been invested in good securities. This state of things is a matter for sincere congratulation, the prosperity of an association being a fair index of the estimation in which it is held.

But while we are looking down our list, and congratulating ourselves upon the increase of our numbers, we cannot fail to see that some have been taken from us since our last meeting.

Amongst the deaths that have occurred since then are those of Mr. Green, of Heckmondwike; Mr. Jenkin, of Southampton; and Mr. Thomas Greaves Barlow. The latter was well known to you all as an honorary member and past president of this association. Mr. Barlow was born in 1811, and after receiving an ordinary education entered the office of his father, and was subsequently admitted as a partner in the firm of John Barlow and Sons, who were engaged in designing and erecting gas-works. In this way he was occupied for a number of years, in the course of which many extensive works both at home and abroad were erected under his supervision. Finding that the gas interest was becoming a most important one, and that there was no publication through which information was disseminated of special interest to the profession, although a periodical started for that purpose in 1847 had failed, he, in 1849, established the JOURNAL OF GAS LIGHTING, which continues, with but little or no alteration, to the present day. In its conduct he endeavoured to maintain a strictly independent course, and although exception was sometimes taken to the policy he pursued, I am persuaded that he most conscientiously believed in the views he supported.

He was decidedly of a conservative tendency, at the same time he was well aware that a liberal and conciliatory system on the part of gas companies as towards the public was the wisest policy, and was ever ready to advocate such a course. Latterly Mr. Barlow had devoted but little attention to the construction of works, being chiefly engaged in the settlement of disputes in the valuation of gas undertakings, and in giving evidence before parliamentary and judicial tribunals. This association is considerably indebted to him for the support he gave it, and for his generosity in furnishing copies of the proceedings gratuitously at a time when the association could ill afford such an expense as the printing of their own transactions would entail. Mr. Barlow had not enjoyed robust health for some years, and for the last 12 or 18 months it had very much declined. He died in September of last year, leaving a vacancy in the gas world that will not be readily filled up.

These remarks regarding Mr. Barlow have been supplied by Mr. Bennett, he having perhaps a longer and closer connexion with our deceased friend than any other member of this association.

I may, however, state that, as far as I recollect, the first gas journal was commenced by Mr. Peckston, and the present one by Mr. George Barlow, uncle of our late friend.

At no former period in the history of gas enterprise have the value and importance of such an association as ours been more apparent. The delicacy, the difficulty, and the complicated nature of the duties which devolve upon the managers are such as to render meetings for mutual counsel and conference especially valuable. Day by day questions arise which concern the whole body of gas producers throughout the kingdom—questions in which the experience of one may be helpful for the guidance of all. The gas engineer of the present day must possess a practical familiarity with the chemical, mechanical, and mathematical sciences. And if professions which require only a comparatively limited range of knowledge meet for the exchange of views and the communication of information, surely we may well do so, who require for the efficient discharge of our duties an acquaintance with sciences so extensive and varied.

Nor is a mere scientific training sufficient for gas engineers.

As managers and employers of a large amount of skilled and unskilled labour, they are necessarily obliged to exercise much discretion and consideration in their relation to the working classes; whilst their business connexions with capitalists, directors, shareholders, and gas consumers bring them into constant communication with many of the most influential and intelligent members of the community. Hence their position is one of much responsibility and importance in its social as well as its professional bearings. And never in the history of gas companies has the weight of the influence of our profession been so clearly manifested to the public as during the disturbed relations between labour and capital which have during the past 12 months so greatly interfered with every branch of national industry, and so directly affected the convenience and interests of gas producers and consumers in particular.

The sudden and extensive combination which, for a short time at least, threatened to plunge the whole of the metropolis in darkness, and which, in fact, occasioned much temporary inconvenience over a large area, forced upon the public in a very effectual and literally *striking* manner some appreciation of the value of the services hitherto rendered by our profession. And whilst there was felt a universal and just annoyance at the unreasonable and illegal action

of these workmen who, to their own ultimate suffering and that of their families, yielded themselves as slaves to the domination of a few unscrupulous and blindly selfish agitators, those events clearly revealed to the public, to an extent never witnessed before, their large measure of indebtedness to the gas companies and their managers.

No words of mine can express too strongly the consternation caused by the prospect of London being left in darkness. For the first time the value and importance of the services rendered by our gas companies to the peace, security, and good order of society, were adequately recognized. If the attempt to suspend the production of gas had been successful, many most important industries would have been crippled or altogether arrested. The police of the metropolis would have been paralyzed—life and property would have been at the mercy of the dangerous classes. A sense of the perils escaped afforded to the public at large, for the first time, a measure of the services rendered.

The admirable manner in which the great difficulties of so sudden and grave an emergency were met and overcome by all the metropolitan companies, proved in the most conclusive manner the high character both of the professional and administrative talent which characterized their management; whilst the fidelity of a large number of the workmen (in spite of the utmost persuasions of the interested ringleaders of illegal agitation), and the eager desire of unemployed mechanics to fill the places rendered vacant by the strike, as plainly showed that the companies had treated their servants with a liberality and just consideration which commended itself to their practical appreciation and to that of the working classes generally.

At the same time the united verdict of the public and of the press ranged itself in favour of the just and able administration of the gas companies, especially as to their relations to those in their employ. Altogether, the body of gas managers can hardly expect ever to witness a more decisive and satisfactory testimony to their merits and abilities than that incidentally occasioned by the circumstances of the past year.

But we must not flatter ourselves that the danger is altogether at an end. The relations between labour and capital, between employer and employed, are far from being finally settled; and an emergency may yet arise which will tax to the utmost the individual and collective wisdom of the British Association of Gas Managers to prevent serious consequences to themselves or the public at large.

In reference to the general subject of the improvements in the manufacture and distribution of gas, I need hardly observe that to enter into details as to those improvements throughout the period which has elapsed during and since my own connexion with the profession would occupy too much of your time. I may, to illustrate, however, what may be done in this direction, briefly mention that when I was first appointed to the charge of the Chartered Gas Company's works at Brick Lane the price of gas was 9s. per 1000 feet, and at that time no attempt at purification was made beyond the use of wet lime and the most ordinary condensation. The gas was so surcharged with ammonia that it was sometimes observed that the worm upon the axis of the drum of the meter and the wheel acting upon it were destroyed with three months work; and, although the meters then in use would, in the case of the 3-light meter, permit a registration of 22 per cent. against the consumer, and of only 15 as against the supplier, yet such was the destruction of the meters that the gas unaccounted for exceeded 20 per cent. The fuel account varied from 50 to 53 per cent. of the coke produced. The retorts were of the 12-inch iron D description, and 7 feet 6 inches in length.

By continued efforts during five years to remedy these defects I had the satisfaction, before leaving the company's service, of reducing the fuel account down to from 15 to 17 per cent., whilst the purification was so much improved as to result in a large diminution of the amount of gas unaccounted for. At the same time the profits of the shareholders had greatly increased.

It may also, perhaps, not be inappropriate to make some allusion on this occasion to the success which attended the formation of the Great Central Gas Company and the establishment of the Surrey Consumers Gas Company, and I may be pardoned for recurring with some degree of pride to the accomplishment of these works under difficulties which appeared almost insurmountable. For example, as is well known, in the case of the Great Central Company alone, the legal obstacles of every kind placed by its antagonists in the way of its obtaining parliamentary incorporation entailed a cost of £29,000. Not merely parliamentary, but municipal, parochial, and even physical impediments of every description were accumulated to hinder its progress. Nevertheless, all the objects of its projectors were ultimately secured; and within three months from the commencement of laying down the mains this work was carried out over 60 miles of streets, sometimes as many as 20 gangs of pipe-layers working simultaneously in as many localities. The whole of Upper and Lower Thames Street, from Blackfriars Bridge to the Tower of London—a distance of about a mile—was thus laid in one night. The mains were of such dimensions that within a leading one (of 26 inches internal diameter) two men proceeded throughout its length, from the gas-works to the City (3½ miles), for the purpose of paying out a telegraph wire, by which constant communication was secured between the works and the City, being the first application, it is believed, of the science of telegraphy to private purposes.

There is, however, no need for hesitation in recalling your attention to the important results, both to the advantage of the general public and to gas manufacturers, which ensued from the parliamentary investigations, the evidence given, and the demonstration of practical improvements connected with the establishment and early progress of the Great Central Company. The facts and figures then placed on record before the parliamentary committee on the bill for the incorporation of that company have, in the words of one of the directors of that company, "formed the basis of all subsequent gas reforms, and have been the means of giving, not only to London, but to all the large towns of the empire, a pure and cheap supply of gas, thereby conferring sanitary and commercial benefits upon all gas consumers." The same gentleman has also written of the Great Central Company, in a letter published two years ago, "This undertaking was not merely a commercial success, but demonstrated that simultaneously the consumer could receive a cheap and pure supply of gas, and the capitalist the largest return for his investment permitted by law" (10 per cent.); and as the following words are not my own, but his, they need not necessarily be omitted. He was pleased to add: "To Mr. Croll the public are indebted for the protection afforded by the appointment of a public officer to test the purity and illuminating power of the gas supplied, as well as the accuracy of the meters used by the consumer in its measurement. This protective power on behalf of the public has been incorporated in all subsequent Acts of Parliament relating to gas companies."

Circumstances connected with the history of the other company to which I have alluded (the Surrey Consumers Gas Company) led, but at a large private cost to myself, to the districting and the resulting combination of the various metropolitan companies—a movement whereby great advantages have accrued to gas interests both in London and the provinces.

The improvements which have taken place in gas property will be better understood when it is considered that at the time when I entered the service of the Chartered Gas Company the average dividend paid by all the companies did not much exceed 6 per cent., whilst it is now the highest allowed by Act of Parliament. And the marketable share value of the various companies may be taken at double what it then was.

Gentlemen, it has been asked, "What are the general objects of this association?" It may be replied that that object undoubtedly consists in the more efficient service of the public, involving as it does the interests alike of the gas producer and the gas consumer. These two are inseparably connected. The public cannot be efficiently served unless the producer is working profitably to himself. An industry which is not adequately remunerated, an investment which does not produce a profit fairly proportioned to the risk and responsibilities of the enterprise, is always conducted in an unsatisfactory manner. It is, therefore, to the interest of the consumer that the producer should derive a fair profit for his labour. And bearing in mind the risks and responsibilities of gas production, the periods over which the manufacture often runs before an adequate return is secured, and various other considerations which will suggest themselves to your own minds, it cannot be said that the parliamentary maximum of 10 per cent. is excessive.

But then, on the other hand, it must be borne in mind that it is at once our duty and our interest to study the interests of the consumer.

Our industry is of necessity a monopoly. We have entrusted to us the sole right of lighting a given area. Rights are conceded to us which, in the nature of the case, drive rivals from the field. These exclusive rights bring with them corresponding duties, and we are not to enjoy the one without caring for the other. And it is our interest as well as our duty to do this.

A monopoly may seem to override the common laws which regulate profit and loss in commercial transactions. But in the long run the principles of political economy prevail, and he who has had a monopoly conceded to him will find that he will work his monopoly most profitably by working it on the same principles as secure success to the manufacturer in the open market. If we attempt to take an unfair advantage of the public, we shall find that our profits are lessened rather than increased. Diminished consumption will follow an excessive price; inferior illuminating power will give occasion for the use of other methods of lighting. Impure gas will lead consumers to employ less injurious substitutes, and the right of monopoly abused will only punish the monopolists; whilst the fair and legitimate working of it would secure advantages to all parties. Hence it appears to me these our meetings ought to be specially occupied in discussing the best means of increasing the accommodation of the public, so far as the supply of gas is concerned. And it should be our study, in the first place, to furnish this in the most convenient manner; secondly, to render it of the greatest possible chemical purity; thirdly, of a high illuminating power; and lastly, at the lowest price consistent with a fair and reasonable dividend to the shareholders.

On each of these points I will offer a few remarks.

First, as to the general principle of seeking to accommodate the public as far as can be done. This principle should be kept prominently in view on various grounds, as being dictated not merely by prudence and self-interest, but also by justice and neighbourly good feeling. Although the companies are, by Act of Parliament, furnished with power to lay down their mains and services to a large extent irrespective of the public convenience as to time, manner, and vested interest, yet it is very inexpedient that their engineers or contractors should use their power in an arbitrary manner, and it is also injurious to the progress and advantage of the companies themselves that such a course should be taken. Even the effort to accommodate the public in the simple matter of time may be attended with great mutual advantage. For example, by means of working by night instead of by day, the Great Central Company were enabled to lay down the mains and services for the whole City of London almost in the same period lately taken by another company in merely laying the mains of two streets (Gresham and Coleman Streets).

Secondly, as regards the purity of the gas. During the whole time of my contract with the Great Central Company, the official analyst, Dr. Letheby, stated that he had never found more than 20 grains of sulphur per 100 feet of gas, and never more than six grains of ammonia to the same number of feet. Hence, in fixing the standard of purity for that company's gas, he gave the largest quantity which he had ever discovered in it as the maximum degree of impurity to be sanctioned. It is, therefore, deplorable to find that of late years the supply of gas which has been forced upon the City of London is so highly charged as it is with bisulphide of carbon. Whereas, by removing the ammonia and using wet lime alone, or oxide of iron and wet lime unitedly, and drawing the retorts before the last dregs of gas have been extracted; or, in other words, by not insisting upon too large a produce of gas per ton of coals, no complaints such as have been so prevalent and troublesome of late need ever be made.

Then as to the illuminating power. To refer once more to the Great Central Company, it is well known that my contract with it as engineer for the manufacture of its gas made an allowance of one halfpenny per 1000 feet for each increase of one candle, from 10 to 16, and be it remembered not tested with a "London burner," but with the old "Dixon's Argand burner," the one which was referred to in the regulations laid down for instituting comparisons as to the standard "candle."

Then as regards price. It is quite evident that this must depend upon many circumstances. It involves necessarily, and as a principal element, the capital expended in the construction of what ought to be useful works, and not wasted in mere embellishment, having reference also to the cost of the wear and tear of the apparatus, the quantity of fuel for the necessary carbonization, the price and quality of the coals employed, the care and attention given to the other residual products, and the labour employed.

Allow me, therefore, to suggest under this head that the members of this association be invited to prepare papers on the question, entering into all these particulars, which should also be considered in their relations to the kind and description of retort used, to the mode of setting, to the size and construction of the gasholders for storeage, to the extent and nature of the buildings erected, the dimensions of the mains and services, the mode of purifying and condensing the gas, and the scale and position of the works. Each suggested improvement might, with much advantage, be illustrated by familiar examples, or by references to the writers own experiences, both as regards failures and successes.

Undoubtedly the gas companies at the present time possess great power and influence, and are in a most prosperous condition. It will, however, be their true interest to use their influence with discretion and moderation. The supply and management of gas is but little understood by the general public, and it is the very nature of ignorance to be suspicious and apprehensive of exorbitant demands. Hence it is not to be expected that, at least to the same extent as in the supply of many other articles, the gas companies should reckon upon the entire approval of the general body of their customers.

But inasmuch as a strong feeling exists in the public mind that some degree of competition in the gas supply is necessary to the common interest, and in order to prevent the inconveniences of monopoly, it will be the true policy of the companies to exercise great care lest any violent outburst of general dissatisfaction should be excited by undue charges, or the supply of gas of inferior quality.

Hence it is very desirable that the companies should be prepared at any time to prove that they have used their power with liberality and discretion. And it will be a most valuable service, on the part of members of this association, to avail themselves of every mode and opportunity of bringing about such a condition of the various gas companies that whenever an investigation may be necessitated they may be able to give satisfactory evidence that they have neither taken undue advantage of their position nor put forth exorbitant demands.

Yesterday I received a letter from our talented president-elect, Mr. Livesey, in which he, after expressing great regret that he is utterly unable to attend the meetings in Edinburgh, requests me to bring before the association a matter in which he takes great interest, and one also which has my warm and

entire sympathy; but I regret that it did not occur to me to mention it in this paper until after I received his letter. He says: "There is another matter in which I take great interest, and therefore trouble you with it. I refer to the question of the suspension of Sunday labour in gas making. The subject has been regularly brought before the meetings for some years past, either by a paper and discussion, the report of a sub-committee, or the president's address. I wish, therefore, to ask you if you can mention it in your address this time. You will remember that one of the demands of the men last year was for rest on Sundays; and both the Chartered and the Imperial agreed to give it as soon as they could make proper arrangements. The Commercial, too, are now stopping from 6 a.m. to 6 p.m.; also the London, the South Metropolitan, the Phœnix, and the Independent. If you can mention the fact that the movement is spreading not only in London, but in many parts of the country also, you will do good service both to the men and the companies employing them."

I will only add, let employers attend to the true interests of the men, and surely a day's rest on Sunday is calculated to make men better morally and physically; and sympathy and kindness with them as men will tend to raise a better feeling, and make them more willing to oblige those employing them.

I now give some account of a few of the inventions claiming attention, and also a short account of the papers now to be read, which has been furnished by your able secretary.

Clock Tower Lights.—There being a vast number of people whose interests, if not their immediate business, are connected with the Legislature and its debates, and to whom the hour of its rising is of importance, it was in 1870 thought by the Government that a signal light placed in the Clock Tower of the Houses of Parliament, and made to burn during the time of its sitting and extinguished at the moment of rising, would be of great advantage. The Government, therefore, sought for a light which could be made to illuminate the whole of an area of 180 degrees at any point within a distance of four miles. The first experiment was tried upon an arrangement contrived by Mr. Sugg, whose knowledge in reference to burners and light-eliminating apparatus is sufficiently well known to need no comment. It consisted of a wooden box with a ventilator at top, and into the front of which was inserted a glass globe filled with water 20 inches in diameter. Within the box and behind the globe were two semicircles of flat-flame lights, consisting of 42 burners, each consuming about 3 feet of cannel gas; or, on the whole, from 120 to 150 feet per hour, which gave a light of from 400 to 450 candles of the parliamentary standard power. This was used for about a month, when, in consequence of the heat, the box became charred and was finally burnt down. From the diagram (Fig. 1) on the wall the arrangement will be perfectly understood. During the preparation of another globe and apparatus, a similar one to that just described, but with a globe only 11 inches in diameter, was employed. These served throughout the session of 1871. At the end of the session of 1871 the new globe arrangement was tried on the north side of the tower. The apparatus was somewhat similar to the one first described, but this time the box or lantern was made of wrought iron, to which was attached a cistern containing water, and provided with a filter so arranged as to furnish a continuous stream of filtered water through the globe, thus keeping it clear and cool. Forty-two burners were placed in one semicircle behind the globe, the consumption and amount of light being much the same as in the first experiment. The light given by this arrangement is the only one that has yet complied with the requirements of the Government—namely, to light at one and the same time all places situated within an angle of 180° and within a radius of four miles, and from the foot of the Clock Tower to the top of Primrose and Highgate Hills. Fig. 2 illustrates this arrangement. The light exhibited in the session of 1872 was an ordinary catoptric harbour light, made by Chance Brothers, of Birmingham, fitted with an Argand burner made specially for it by Sugg and a Fresnel lens. This apparatus is shown in Fig. 3. The rays were thrown horizontally in only part of a semicircle, and vertically from the Duke of York's Column to the top of Primrose and Highgate Hills, or concentrated into about 50°. The light emitted from it was as nearly as possible at Primrose Hill equal to Sugg's light, but at the Duke of York's Column, or about half a mile off, Sugg's was most intense, as will readily be understood when it is considered that the 180 vertical rays which were thrown out by Sugg's light were concentrated into about 50 by the catoptric lens. The quantity of gas consumed by the Argand burner was little more than half that consumed by Sugg's flat flames. No regular experiment comparing the actual consumption of the two was ever made, so that the quantity named is therefore only an estimate. In the present session of 1873 two lights have been and are still in course of trial—the one a light designed by Mr. Wigham, and the other a magneto-electric light contrived by Gramm. A description and illustration of Wigham's light will be found in the last number of the JOURNAL OF GAS LIGHTING. It is, however, a vibrating light, and only lights a portion of the semicircle at a time, and in a downward direction the rays strike from the Duke of York's Column to Primrose Hill. The consumption of gas varies from 300 feet per hour to 12,000. The illuminating power has not been determined. The magneto-electric apparatus of Gramm is fixed in the basement of the Clock Tower, and is driven by an engine formerly used for Reid's ventilating apparatus. The conducting copper wire or road is half an inch in diameter. The light has a deflecting and vibrating apparatus by which the ray is made to impinge upon any part of the semicircle, but only one pencil of light is thrown in one direction at a time.

From the "Standard," May 30, 1873.

"*The Electric Light at the Houses of Parliament.*—We have already described M. Gramm's admirable electro-magnetic machine in considerable detail, but as the members of the press were on Monday night invited into the Clock Tower, where the light is burning, we may well take the opportunity of describing the exceedingly ingenious mechanical and electrical arrangements devised by Mr. Conrad Cooke in the lighting apparatus itself. The given object being to throw the light beam in various directions at stated intervals, the mechanical arrangements had to be brought into harmony with the electrical currents. The exchange of lamps, too, had to be provided for in a sufficiently rapid way that there should be no practical break in the signal light. This not on account of any possible accident, but for the reason that the carbon points will only burn four hours, and the House often sits eight and ten. Three distinct mechanical motions had therefore to be arranged. In the first place, however, a solid fixing had to be given to the whole apparatus. To this end a solid fixed table is made the basis of the entire system. Upon it is a gun-metal ring or tram, and through the centre of the table a pin of gun-metal is brought up; over this is a second rotating table, mounted on metal rollers which run on the circular tram on the fixed table. The gun-metal pin is brought up through this rotating table also, and forms a pivot for it, and there is a rack and pinion motion along the edge of this table for moving it. The rotating table thus provides the training of the beam, if we may use the expression; but to give the elevation and depression, a third table, hinged by two hinges at the fore part, is added, and at the rear of it is an elevating screw working against a reciprocating nut. To this third table the holophote is attached at right angles to its surface. As the elevating screw is worked the rear is raised or depressed, and the angle of the beam is altered accordingly. Now, to accommodate the electrical current with this, the wire leading from the negative pole of the machine is attached to the base of the metal pivot. From the right metal hinge a metal lever extends to the top of the pivot, upon which it moves when the table is rotated. A wire leads from this hinge also along the top of the third or elevating table to a metal stud in the fourth or lamp table which stands fixed on the elevating table, and this stud forms the terminal of the negative wire. The positive wire from the machine is attached to a metal tram or ring on the fixed plate. From one of the rollers a stud comes up through the rotating table, and a wire connects this stud with the left hinge, from which again a wire leads to a second metal stud on the lamp table, forming the positive terminal. The two lamps are carried on a miniature trolley, at the bottom of which are two sets of metal springs so adjusted that when one lamp is in position in the centre of the holophote its springs are in metallic contact with the two studs by which the electrical currents flow. As this is run off the springs of the other lamp come into electrical contact, and so on, and in this way the changing of the lamps brings one light into play as the other goes out, and the practical continuity of the signal is maintained. The view from the lofty eminence of the tower excited great enjoyment, and the various effects produced by the wonderful light were closely scrutinized and admired. Colonel Stuart Wortley, who has taken great interest in the light, and issued invitations, was present, as also were Mr. Werdermann, the proprietor of the English patent, and who has himself, we believe, introduced matters of considerable interest in connexion with the invention, and Mr. Edwards, a gentleman who has likewise interested himself greatly in the success of the light. To Mr. Conrad Cooke too much credit cannot be given for the perseverance, ability, and skill with which the whole of the details, as well as the general arrangements, have been carried out."

Eldridge on Coffey's Still.—The writer of this paper explains the construction, and advocates the use of Coffey's still for the extraction of ammonia from gas, principally on account of its giving no pressure, and ensuring that the whole of the gas shall pass through a considerable quantity of water in the course of its ascent.

Warner's Paper on Distribution, &c.—Assuming gas to be good and the manufacture economical, Mr. Warner points out that the satisfactory lighting of a town is dependent upon a perfect distribution, and as this cannot be accomplished without a thorough acquaintance with the machinery for the purpose, it is necessary that a perfect registration of the whole of the details should be made, and then again classified and tabulated for reference and comparison. To gas managers, it is said, a moment's reflection is not needed for it to be seen how close is the relationship between this subject, complaints, and unaccounted-for gas.

Parlby on Stopped Ascension-Pipes.—In this paper the cause of stopped pipes is attributed to high heats, allowing the charge to remain in longer than is necessary to drive off the gas, too deep a seal to the dip-pipes, irregularities or defects in the casting of the ascension-pipes, and a hydraulic main of insufficient size to carry off the gas freely. The remedy is the avoidance of these errors, and taking care to charge the hottest retorts with a proportionately heavier charge, so that the whole may be worked off in the same time.

Green on Stopped Pipes.—Mr. Green, in his paper on stopped pipes, advises the use of a screen placed in the retort mouthpiece, between the ascension-pipe and the charge, as a remedy, and states the success that has attended his plan.

Methven on Coal Wasted in Gas-Works.—This paper points out how advisable it is to have a competent manager, and make him responsible for the coals consumed. The remarks are directed principally to very small works.

Emmerson on Unaccounted-for Gas.—The author considers it absolutely necessary to take a fair start in tracing the causes, and that due correction should be made for temperature, &c., when determining the amount of gas actually made, in comparison with that recorded by the station-meter, and attributes loss to a variety of causes, such as unsound gasholders, small and imperfect pipes and careless main-laying, unsuitability of joints for the ground in which the pipes are laid, chipping instead of drilling holes for services, want of provision for equalizing pressure in hilly districts, unregulated public lights, and want of attention to the keeping of their services in good repair, improper selection of meter to suit the particular place and circumstances under which it is, placed, and neglect of a periodical inspection. The remedy is, of course prompt and regular attention to all these points.

Skelton's Paper on Gas Street Lighting treats on the various forms of lanterns invented for utilizing as much as possible the rays of light which in the ordinary lamp, if not lost, are made but little use of, and divides the lanterns into three classes—radiating, refracting, and reflecting—and comes to the conclusion that the catoptric lamp, which is his own invention, is the best. He also notices the method of lighting by the rod, and an improved method of closing the bottom of the lamp.

Hartley's Paper on Coal Gas as a Fuel.—Mr. Hartley draws a direct comparison between the cost of gas and of solid fuel (coals) as a heating agent for steam-boilers, showing the great economy of coals on the large scale. He then makes a similar comparison in respect to cooking on a large scale, principally in respect to boiled or steamed food. Great waste of heat is shown to arise from the use of gas for merely boiling as compared with steaming food. Some consideration is given as to an open gas fire and to an open coal fire for boiling and roasting, and advocates the use of gas for roasting and baking under nearly all circumstances. He then enters upon the character of heating gas stoves, and divides them into simple cylinders, multiple cylinders, tubular stoves, reflector stoves, and stoves with solid heated materials. He advises the use of the latter in conjunction with a large radiating or conducting surface. He insists upon the ventilation of all heating stoves as indispensable, and concludes by showing the advantages of gas, spite of its cost, for heating conservatories and similar places.

Frith's Paper on Book-keeping.—Mr. Frith in his paper explains the system of double entry, which he describes as one which is sometimes thought to involve double labour as well, but asserts that what is worth doing is worth doing well, and that in reality, especially where the manager acts as engineer, secretary, and other officers as well, the system he advocates is in the end far less troublesome and infinitely more correct and satisfactory than any modification or extension of the single-entry plan. He expresses surprise at hearing of a company with £370,000 capital working without a cash-book, and states that the imperfections or absence of system in the keeping of books and gas companies accounts that have come under his notice has induced him to lay before his brother managers what he considers to be a concise and simple plan.

Gore on Substitutes for Coal in the Manufacture of Gas.—Treats upon the use of oils, resins, wood, mineral pitch, the decomposition of steam and its subsequent carburation, and the carburetting of air. He reviews the different apparatus and processes employed, and gives the result of his experience and observations in many towns on the continents of Europe and America, the conclusion being that there is no material or process superior to that generally employed in this kingdom.

Jones on Gasholder Capacity compared with Consumption.—From returns made to him from 153 gas-works he finds that the average is 89·77 per cent. in comparison with the maximum daily of consumption, and that the extremes range from 32 to 200 per cent.

Dempster on Choice of Materials and Construction.—Relates to the selection of proper fire-clay for the uses to which it is to be applied, and refers to the construction of chimneys.

Paterson on Flow of Gas through Pipes.—This paper gives a brief history of the discovery of the laws which govern the flow of gas through pipes. The accuracy of the co-efficients from which the formula has been determined compared with the results of experiments made by the writer in 1872 on a 16-inch main. He considers that if any modern experiments seem to require a modification of the constant co-efficient 1350 to tally with the results, the probability is that inaccurate values have been attached to some of the data, and that with the exception of two slight errors he considers the article in

"Clegg" as the most valuable elucidation of the subject which has yet appeared, and a safe and reliable guide in the hands of the gas engineer.

Sugg's Paper on Standard Burners.—Mr. Sugg describes the first standard burner, and states Mr. Hughes's ideas thereupon, the principle laid down by him being that the burner which developed the illuminating power the least was the proper one for what he (Sugg) calls "adverse" testing. He then describes the Birmingham standard burner and its defects. The Leamington burner is treated in the same way, as also those for Dublin for 16-candle and for common gas. Consideration is given to the principle enunciated by Mr. Cardwell's committee—namely, that the companies had a right to demand the use of that burner which gives the best results in illuminating power, and is at the same time suitable for consumers in ordinary use. The result of this was the construction of the London burner, and its adaptation to cannel gas. A description is also given of the Dublin cannel gas-burner and its defects, and reference is made to the gas referees standard cannel gas-burner. Mr. Sugg next examines the question from different points of view with regard to the employment of flat-flame burners for testing the illuminating power, and finally shows his views as to the requirements for a standard burner, and proposes to use a system of standard burners which would obviate the difficulty which arises from the present unsettled state of the question.

PROPOSED ESTABLISHMENT OF A BENEVOLENT FUND.

At the close of his address,

The PRESIDENT said: The first matter on the *agenda* is the reception of a report from the committee on the establishment of a benevolent fund. Since the last meeting a circular has been sent to each member of the association, with the view of ascertaining the probable extent of support which such a fund would receive, and the committee have unanimously come to the conclusion that the answers they have received are such as would not justify them in recommending the establishment of such a fund in connexion with the association. Upon this subject, however, a report will be presented to the meeting at a later period, which I have no doubt will meet your approval.

The reading of papers was then proceeded with. We name them in the order in which they were read, reserving their publication and the discussions thereon for a future number.

Mr. J. ELDRIDGE, of Richmond, read a paper "On the Application of Coffey's Still for the Extraction of Ammonia."

Mr. WARNER, of South Shields, read a paper "On Distribution of Gas, and the Importance of having a Complete and Perfect Register of Distributing Plant."

The morning sitting then closed.

The first paper read at the afternoon sitting was by

Mr. W. B. EMMERSON, of Darlington, "On Loss, or Unaccounted-for Gas."

Mr. GREEN, of Dartford, read a paper "On Stoppages in Ascension-Pipes."

The SECRETARY, in the absence of the writer, read a paper by Mr. W. Parlby, of Aylesbury, on the same subject.

In each case thanks were voted to the writers for their contributions, and this closed the business sitting of the first day.

At seven o'clock in the evening a *conversazione* was given in the University Museum of Science and Art, by the Edinburgh friends, to the members of the British Association and the North British Association. Upwards of 700 ladies and gentlemen were present, and enjoyed the opportunity of inspecting the interesting and valuable natural history collections, architectural and engineering models, and specimens illustrating the sciences of metallurgy, chemistry, &c., &c. The spacious and elegant rooms were brilliantly lighted, and the band of the 91st Princess Louise (Argyleshire) Highlanders enlivened the proceedings by playing a choice selection of music.

At eight o'clock a lecture was delivered in the hall of the museum, by Dr. Stevenson Macadam, F.R.S.E., F.C.S., &c., &c., "On the Physico-Chemical Properties of Gases," with experimental illustrations. (We shall report the lecture in a future number.) At the close of the lecture, which was listened to with great attention and interest, the president moved a vote of thanks to Dr. Macadam, which was cordially adopted. The members of the association and their friends then resumed their promenade through the various galleries, in one of which refreshments were served, and the proceedings of the evening were sustained till after eleven o'clock.

WEDNESDAY, JUNE 12.

The president took the chair at eleven o'clock this morning, and the reading of papers was resumed.

Mr. T. H. METHVEN, of Bury St. Edmunds, read a paper "On Coal wasted in Gas-Works."

Mr. HARTLEY, of Westminster, read a paper "On Coal Gas as a Fuel."

Mr. T. A. SKELTON, of London, read a paper "On Gas Street Lighting."

Mr. J. R. FRITH, of Runcorn, read a paper "On a Plain System of Book-keeping by Double Entry, specially adapted for Gas Companies."

Mr. RANDALL, of Tottenham, read a paper "On the Computation of Gas Accounts arising from the Non-Registration of Meters."

At the afternoon sitting,

The SECRETARY, in the absence of the writer, read a paper by Mr. H. Gore, of London, "On Substitutes for Coal in the Manufacture of Illuminating Gas."

Mr. R. H. JONES, of Dover, read a paper "On Gasholder Capacity compared with Consumption."

The reading of these papers, and the discussions thereon, occupied the whole of the time available for this part of the proceedings, and the following communications were necessarily omitted, but by the kind permission of the writers they will appear in the "Transactions" of the association:—

"Standard Gas-Burners," by Mr. W. Sugg, London.

"A New Compensator and Bye-Pass," by Mr. D. Laidlaw, Glasgow.

"Construction and Choice of Materials for Gas Apparatus," by Mr. R. Dempster, Elland.

"On the Method of Calculating Flow of Gas through Pipes," by Mr. J. Paterson, Warrington.

ELECTION OF OFFICERS.

The scrutineers reported the result of their examination of the ballot papers, from which it appeared that the following gentlemen had been elected as officers, &c., for the ensuing year:—

President.—G. T. Livesey, Esq.

Vice-Presidents.—Messrs. James Paterson, Joseph Wood, and Thomas N. Kirkham.

Treasurer.—H. Newall, Esq.

Committee (new members to replace those going off by rotation).—Messrs. A. Cockey, C. Craven, and H. Bowen.

Auditors.—Messrs. S. P. Leather and A. Hersee.

Secretary.—Mr. W. H. Bennett.

TIME AND PLACE OF NEXT MEETING.

It was resolved that the next annual meeting be held in London on the second Tuesday in June, 1874.

REPORT OF THE COMMITTEE ON THE ESTABLISHMENT OF A PROVIDENT FUND, PROPOSED AMALGAMATION WITH THE NORTH BRITISH ASSOCIATION, &c., &c.

Mr. WOOD, of Bury, in the absence of the secretary from temporary indisposition, read the following report:—

Gentlemen,—In accordance with the resolution passed at the last annual general meeting in reference to the establishment of a benevolent fund, and deputing the committee to consider the arrangement and disposal of such fund if one were formed, your committee beg to report that a circular was sent out to each member for the purpose of ascertaining how many subscribers there would be, and the probable amount of income that might be depended upon. The responses to these inquiries are in the opinion of your committee insufficient to justify the recommendation of the establishment of such a fund.

The president, however, is most anxious to promote the interests of the association, and has, therefore, desired the acceptance of the £100 which he proposed to contribute to the benevolent fund, to be invested for the benefit of the association in such manner as a committee, consisting of himself, Mr. Church, and Mr. Goddard, shall think fit, and that the interest arising therefrom be devoted to the award of a special premium for meritorious papers read before the association.

In consequence of the increasing income of the society, the committee recommend that a special committee, consisting of three members resident in London, be elected to act as a Finance Committee, with instructions to open a banking account in the name of the association; and, in future, all payments be made by cheques signed by two members of such committee, and countersigned by the secretary.

The committee therefore propose—"That the Messrs. Thomas Livesey, J. Church, and G. W. Stevenson be and they are hereby elected as a Finance Committee for the ensuing year, and that such Finance Committee meet periodically, and be *ex officio* members of the general committee during their term of office."

It was unanimously resolved, at a committee meeting held on the 22nd of April last—"That in consideration of the valuable services rendered to this association by Mr. William Sugg and Mr. F. W. Hartley, those gentlemen be recommended for election as honorary members."

At a meeting of the committee, held on the 22nd of April last, the propriety of establishing an office in London for the use of the association was suggested, and as Mr. Bennett had a room which could be placed at their disposal, it was unanimously resolved—"That a provisional arrangement be entered into with Mr. Bennett for the use of one of his rooms for the purposes of the association, at a rent of not more than £40 per year."

It was also unanimously resolved at the same meeting—"That the association be recommended to appoint Mr. W. H. Bennett as their secretary, at a salary of £100 per annum."

It is also proposed by your committee, in consideration of the high scientific attainments of Dr. Stevenson Macadam, and his kindness in consenting to deliver to the association the valuable lecture of yesterday evening, that he be elected an honorary member of this association.

The PRESIDENT: I have now to lay before the meeting a resolution which has this day been adopted at the meeting of the North British Association of Gas Managers. It is as follows:—"That while this association desires to maintain friendly relations with the British Association of Gas Managers, by having combined meetings as frequently as possible, and in other ways to promote the interests of both societies, resolved that in the meantime the North British Association retain its independent position, and take charge of its funds and all matters necessary to its continuance." You will please take this as a part of the report of your own committee, and I shall put it to the meeting that you approve of the report in its entirety. I may tell you that the committee have fully and repeatedly discussed every point mentioned in the report, and in presenting it to you I can give you the assurance that every suggestion has met with their unanimous and unqualified approval. I therefore have much pleasure in moving the adoption of the report.

Mr. G. ANDERSON seconded the motion, which was unanimously agreed to.

THANKS TO THE SECRETARY.

The PRESIDENT: Gentlemen, the next business has reference to our secretary. I think that a gentleman who has devoted so much time and talent as Mr. Bennett has done to the interests of this association deserves a special acknowledgement of his services. I propose, therefore, that in his absence we give him a hearty vote of thanks.

The resolution was put, and carried unanimously.

PROPOSAL TO PRINT PAPERS BEFORE MEETING.

Mr. DOUGLAS suggested that it would be advisable, in making arrangements for the future meetings of the association, that the whole of the papers to be read should be printed, and copies sent to the members some time previously, so that they might come better prepared to discuss them than they could possibly do after hearing them read at the meetings.

The PRESIDENT said he thought it would be impossible to carry out such a plan, as, notwithstanding every exertion on the part of the committee and the secretary, many of the papers were not delivered by the writers till shortly before the meeting.

Mr. BROADHEAD corroborated the remarks of the president, and quaintly remarked that he feared, if the papers were circulated before the meeting, some of the members would stay at home and read them quietly by themselves, instead of joining their brethren for discussion and the interchange of thoughts upon them.

Mr. METHVEN doubted whether there need be any difficulty in the matter. The committee could as readily obtain the papers two months before the meeting as one week, if they would only limit the time for receiving them. He took the opportunity also of remarking that when members had gone to the trouble of preparing papers, they would scarcely be satisfied if they were left out in the cold, and no discussion took place upon them.

The PRESIDENT announced that he had received a letter from the manager of Young's Paraffin Light and Mineral Oil Company, conveying an invitation from the directors of that company to the members of the association to inspect the various processes carried on at their works in the manufacture of paraffin oil.

NEW HONORARY MEMBERS.

Mr. HARTLEY: Gentlemen, I simply ask permission to return my thanks for the honour you have just conferred upon me by electing me an honorary member of this association. I cannot, in the few words I feel at liberty to detain you with, express the gratification which your kindness has awakened in my breast. I will only say, I fully appreciate the compliment paid to me, and offer you my sincere thanks.

Mr. SUGG: Gentlemen, permit me also to express my thanks for the great honour done to me. I can assure you that, as in the past so in the future, I shall endeavour by every means in my power to forward the interests of the association.

VOTE OF THANKS TO THE PRESIDENT.

Mr. GODDARD: I am sure, gentlemen, we cannot allow this session to terminate without expressing our thanks to Mr. Croll for the very able manner in which he has presided over the business of the meetings. I have, therefore, great pleasure in proposing—"That the thanks of this meeting be presented to A. Angus Croll, Esq., for the very able manner in which he has conducted the business of this session."

Mr. JABEZ CHURCH: I have great pleasure in seconding a proposition which, I am sure, will be received by the meeting in the most cordial manner.

The motion was put, and carried by acclamation.

The PRESIDENT: Gentlemen, I can only say that I fully appreciate your kindness, and that I thank you very much for the vote you have just passed. It has been a great pleasure to me to preside over your deliberations, and I feel grateful to every member of the association for the great attention and consideration shown towards me while occupying the high position to which you elected me. I shall ever remember your kindness and the great courtesy exhibited to me, and I shall continue to cherish, as I have hitherto done, a warm interest in the affairs of the association.

The business sittings were thus brought to a close.

During the meetings of the association, a number of drawings and models were exhibited in the hall, which excited a considerable amount of interest. Among these we may mention—

Drawings of apparatus for the purification of gas from ammonia, sulphur, and carbonic acid, by Mr. George Anderson.

Drawings of combined self-acting bye-pass and compensator, by Messrs. Laidlaw.

Drawings of exhauster-house, showing position of connexions, exhauster, and bye-pass valve for Salford Corporation Gas-Works, by Messrs. Laidlaw.

Drawings of exhauster and engines for Salford Corporation Gas-Works, by Messrs. Laidlaw.

Model of patent self-acting hydraulic safety-valve for preventing the back flow of gas from gasholders, by Messrs. Thomas and Caffall.

Model of Best and Holden's apparatus for drawing and charging retorts, by the Steam Stoker Company.

Model of Somerville and Robinson's apparatus for drawing and charging retorts, by the Steam Stoker Company.

Drawings of breeze and tar fuel machines, with specimens of breeze and tar made into fuel therewith, by Mr. G. Anderson.

Banquet in the Masonic Hall.

On the evening of Wednesday, a grand banquet was given by their Scottish friends to the members of the British and North British Associations, in the magnificent hall of the Freemasons, George Street. The company, which numbered nearly 350 gentlemen, were seated at four tables at right angles to the raised platform at which were the chairman and his supporters, and extending the whole length of the rooms. These tables were tastefully ornamented with plants and flowers. William Fraser, Esq., of Inverkeithing, occupied the chair; and A. Donaldson, Esq., of Edinburgh, officiated as croupier. The chairman was supported on his right by Edward Goddard, Esq., Mayor of Ipswich; Jabez Church, Esq.; Bailie Cousin, Dr. Stevenson Macadam, G. Harrison, Esq.; Major Laidlaw, and on his left by Messrs. J. K. Watson, Edinburgh Gas Company; Ronald Johnston, C.E., Glasgow; J. Reid, Edinburgh and Leith Gas Company; J. Milne, Edinburgh; H. Bartholomew, Glasgow; George Garnett, Ryde; Samuel Stewart, Greenock; R. P. Spice, London; W. H. Bennett, secretary. The croupier was supported by ex-Councillors Romans, Henry Alder, James M'Kelvie, Edinburgh; D. M. Mackay, engineer; Alexander Mackay, meter manufacturer; William Brown, Manchester; and Mr. Burgess, Huddersfield.

The banquet was served in most excellent style by Messrs. Hunter and Glover, St. Andrew's Square, and ample justice was done to it by the assembled guests.

After dinner, the Chairman gave the toast of "The Queen," which was enthusiastically received, the company singing the National Anthem. The next toast, "The Prince and Princess of Wales, and the other Members of the Royal Family," was equally honoured, the company singing, in full chorus, "God Bless the Prince of Wales."

The Chairman next gave "The Navy, Army, and Reserve Forces," which was cordially received, and was briefly acknowledged by Major Laidlaw.

The Croupier, in appropriate terms, gave "The Lord Provost and Magistrates," and he read apologies for unavoidable absence from the Lord Provost and other members of the Edinburgh Town Council.

The toast was heartily responded to.

Bailie Howden, in reply, said he had been called upon more than once to respond to a similar compliment, perhaps not in a meeting so largely attended, but he had never been called upon till then to acknowledge the compliment from a body of gentlemen possessed of such high culture and such distinguished scientific acquirements as were met there that evening. He concluded by regretting that no time had been given the town to welcome the associations as befitted Edinburgh, but he was sure the citizens would be delighted to see them back again. If the magistrates had been informed in time of the arrival of such a distinguished body they would have taken some means of manifesting their approbation of their visit, and shown them more kindness and hospitality than they had been able to do.

The Chairman then said he rose with some diffidence and with much feeling to propose what might be called the toast of the evening. He wished that some abler man, and one occupying a higher position than himself, had had an opportunity of doing it rather than he, but, at the same time, he was willing to do the best he could, and he was very much encouraged to proceed with the toast, because he felt that it was one which required not the flowers of eloquence. When the British Association of Gas Managers resolved last year that it should meet in Edinburgh this season, he, along with two or three friends who were there as extraordinary members, immediately determined in their minds to make the meeting in Edinburgh more than usually successful and attractive—to make it as auspicious as any that had gone before of this excellent and worthy institution. On their returning to Edinburgh, they found that their friends here were inflamed with same desire. The feeling which animated all of them was this—that as in the course of business they had occasion to visit England and Ireland, and there received kindness from one and all, they should certainly do something to honour them on this occasion. When in England, they had formed friendships which they had found to be as warm and true as any they had had the pleasure of forming. He had been a member of the British Association for four years, and at every meeting since that time he had attended with great comfort and pleasure. He always looked forward to the annual meeting, as from the instruction there given he reaped great advantages.

The toast was drunk with great cordiality.

Mr. Jabez Church, ex-president, said he was unexpectedly called upon to respond to the toast, owing to the indisposition of their worthy president, Mr. Croll. The Association of Gas Managers had been established ten years ago, and the child which was born at that time had grown and prospered until it now presented a most healthful and robust appearance. That was a source of congratulation to them all. The association had been formed to enable them to have a social interchange of thought on matters pertaining to their profession, and to afford an opportunity to the younger members to profit by the wisdom and experience of their elders; and what the juniors learned in this manner they ought to acknowledge with gratitude, and appreciate as of the greatest value. He thought the association had done good, not only to its own members, but to the public generally. According to his own experience he thought the interests of gas managers were identical with those of the shareholders and consumers. If they were not, they were placed in a false position. Assuming it to be the fact, however, it behoved them to determine the best means of producing an article which was now of the greatest possible importance both commercially and socially. Without being egotistical, they should look upon themselves as the lights of the present day. He thought there ought to be a spirit of emulation amongst them, that they should not be satisfied with the present means of lighting, and he was of opinion that hereafter there would be great improvements made in the manufacture of gas, and a reduction in the cost of its production. They should embrace all inventions of a practical nature which would assist in the development of such improvements, because in doing so it would be to their interest individually as well as collectively. In coming to Edinburgh, he was sure all the members of the British Association were gratified and delighted with the reception their Scotch brethren had given them. They had had great expectations, but these had been perfectly overwhelmed—they had no proper idea of the magnificent manner they were to be entertained in Scotland. It was, he could assure them, the best the association had ever met with in their history; and while cordially thanking the Scotch brethren, he expressed the hope that they would be privileged to meet with them again in Edinburgh.

The Chairman next proposed the "North British Association of Gas Managers." In doing so he referred to the proposed amalgamation of the two societies. It had been resolved, he said, at all events by the Scotch association, not to go on at present with that union. One of the considerations which had influenced a number of the members was this, that if they were obliged to follow the united association through the country—say at Leeds one year, and Southampton another—they would find it very difficult to attend. They all acknowledged that they received great benefit from the Scotch institution, and most of them attended the meetings with great regularity. The papers read at their meetings were of such a high character that he believed they would stand alongside any read at the sister society. The Scotch association was now 14 years old, and he believed was the pioneer to some extent of the British Association. He trusted the society would go on as prosperously as ever, and be the means of doing much good to the members composing it. There was no feeling of jealousy or rivalry existing between the two associations, and this he was sure their English friends would abundantly prove by drinking the toast with all the honours.

Mr. J. K. Watson, of Edinburgh, a past president of the North British Association, in replying to the toast, said that no one would regret the desire to continue the association as a separate institution, but at the same time he thought it was almost a pity that the union had not been effected.

The remaining toasts were—"The Secretaries," given by Mr. D. Bruce Peebles, and responded to by Mr. Bennett and Mr. Wm. M'Kenzie; "The Directors of the Gaslight Companies of Great Britain and Ireland," by ex-Councillor Romans; "Dr. Stevenson Macadam," by Mr. John Reid, Leith; "The Commercial and Industrial Interests of Scotland," by Mr. E. Goddard, Mayor of Ipswich, and responded to by Mr. George Harrison; "The Press," by Mr. Paterson, Warrington, replied to by Mr. W. B. King, of the Journal of Gas Lighting; "The Chairman;" "The Croupier," by Mr. Jones, Dover; and "The Stewards," by Mr. Macnie, Londonderry.

The proceedings, which were enlivened with several songs, were of an enthusiastic description, and the company broke up at a late hour.

Thursday, June 12.

The proceedings in connexion with the joint meetings of the associations were concluded this day by the excursion which had been arranged by the Scotch friends, to which reference was made in the last Journal.

A special train at 8.40 a.m. from the Waverley station conveyed the company, which numbered nearly 320, including many ladies, *vid* Falkirk, to Cowlairs, and thence to Helensburgh, the pace being slackened as the train passed the extensive new gas-works now being erected by the Corporation of Glasgow at their Dawsholm station, where, had time allowed, advantage would have been taken of the permission given by Mr. Foulis, the engineer, to make an inspection. Arriving at Helensburgh shortly after eleven o'clock, the company were met at the station and welcomed by a large number of friends, and also by a couple of pipers in full Highland costume. Preceded by the pipers, the party went from the station to the steamer *Chancellor* at the end of the pier, a number of Scottish airs being played along the route. The steamer crossed the Clyde to Greenock, and thence proceeded up Loch Long. A heavy rain set in, and unfortunately continued to prevail until within a few minutes of the arrival at Arrochar, so that much of the magnificent scenery through which they passed was lost to all but a few hardy souls who were prepared to brave the elements on deck. At Arrochar the party disembarked, the gentlemen walking across the moorland to Tarbet, and the ladies being conveyed in vehicles which were in waiting. On the arrivel at Tarbet, photographic groups of the party were taken on the green in front of the hotel, and we may state, for the information of the friends, that copies of these photographs may be obtained on application to Mr. John Stuart, photographer, 120, Buchanan Street, Glasgow. This permanent memorial of their bodily presence in the Highlands having been completed, the company, with sharpened appetites, embarked on board the splendid steamer *Prince Consort*, which lay off Tarbet on Loch Lomond directly opposite Ben Lomond, and here an excellent dinner was served under the purveyorship of the steward, Mr. William Lang. A short sail up the lake was then made towards Inversnaid, that the visitors might catch a glimpse of some of the finest scenery of this romantic district, for which the clearing up of the weather gave a full opportunity. The steamer then proceeded southward, landing the passengers at Balloch, whence they were conveyed by train to Edinburgh. On arriving at the Waverley station, the company assembled in a group on the platform, and

Mr. Jabez Church was called upon to address them. He said: Mr. Fraser, Mr. Donaldson, and gentlemen of the Entertainment Committee, I have been requested by the guests whom you have so generously entertained to express to you before we finally part the high sense we cherish of your lavish kindness, and of the pleasure we have derived during our visit to your city. You have this day given us an additional proof of your kind and fraternal feeling, and of your unbounded hospitality. You have not only studied our creature comforts in a manner which we all most heartily appreciate, but you have given us food for our souls. You have taken us to see some of the beauties of your romantic country, and the scenes we have had the privilege to visit to-day will dwell as pleasant memories with us during life. We cannot part without offering to you the assurance of our heartfelt gratitude, and of our entire satisfaction with the arrangements made by you for our comfort and enjoyment.

Mr. Goddard, in seconding the vote, said: Gentlemen, I was requested to say a word or two in acknowledgment of your great kindness to us as an association, but my friend Mr. Church has so completely embodied our feelings in the few remarks he has made that it is unnecessary I should make any observations. You have entertained us most sumptuously; we have had "the feast of reason and the flow of soul;" we have had the privilege to meet face to face with gentlemen with whom we have corresponded for years, but whom we never saw before, and I am sure that friendships have been formed since we have been in Edinburgh which will be cherished as long as we live. We leave your modern Athens at the call of duty, with feelings of regret, but we carry with us the remembrance of your hospitable reception, and offer to you our most sincere and hearty thanks for the same.

The resolution was carried amidst loud cheers.

Mr. Romans responded, expressing on behalf of the Scotch friends their great delight at the pleasure they had been able to furnish to the members of the two associations. It was most gratifying to find that no sooner was the proposal made to give a friendly reception to the visitors than it was entered into with the utmost cordiality, and in the most liberal spirit. All the necessary arrangements to carry out their desires had worked most smoothly and pleasantly, and it would be to the subscribers, as well as to the Entertainment Committee, a very pleasant thing to receive the vote just carried as the expression of the satisfaction of the members of the association with the efforts made to render their visit to the metropolis of the North an agreeable one.

Mr. Donaldson also acknowledged the vote, and proposed three cheers for the ladies who had accompanied the members on the excursion.

The invitation was very heartily responded to, and the whole company having joined in singing "God Save the Queen," the proceedings connected with the anniversaries of the associations were brought to a close.

ON THE PRACTICAL USE OF LENSES AND REFLECTORS IN ARTIFICIAL ILLUMINATION, WITH ESPECIAL REFERENCE TO STREET LIGHTING.

[A paper read before the Society of Arts, by Mr. T. A. Skelton.]

The subject of artificial illumination has for many years engaged a large share of scientific attention, but perhaps public notice has never been more forcibly drawn to its consideration than at the present time.

The increase in the price of coal and in the cost of labour has resulted in a general advance in the price of gas. This circumstance has favoured or necessitated the introduction of improvements in the manufacture of ordinary gas, and has encouraged the promotion of inventions for the production of illuminating gas from other materials than coal, and it has also brought into prominent notice other means of obtaining artificial light.

These questions will probably attract even yet more attention during the present year; and as "Artificial Illumination by all Methods, Gas and its Manufacture," is to form one of the chief subjects of the London International Exhibition in 1874, it may be anticipated that the public as well as those more immediately concerned in the details of these questions, will look to that exhibition, not only for a full and complete representation of the subject, and for a comparison of the rival methods for the production of artificial light, but also for an illustration of the means of using it with the greatest economy and effect.

It is with the utilization of artificial light that I have the honour to engage your attention this evening, and I shall first beg leave to impress upon your minds the fact that however successful the attempts to improve the methods of the production of such light may be, either in increasing its intensity or in diminishing its cost, the scientific application of lenses and reflectors will still be for some purposes absolutely necessary, and for many others will give valuable aid to artificial light by yet further increasing its lighting power, by controlling its direction or by reducing the quantity of light necessary to produce a required effect of illumination.

The optical principles upon which the action of lenses and reflectors depends are so generally well known, and were, in the first series of "Cantor" lectures in the present session of this society's proceedings, so minutely explained, that I need only very briefly refer to them on this occasion.

Firstly, you are aware that light, meeting with a reflecting surface, is deflected from it at an angle equal to the angle of incidence.

Secondly, that a prism of glass may be used as a reflector by using the internal and total reflection from what we may term the interior of one of its sides.

And, thirdly, that light passing through a transparent body, such as a lens, will be refracted from its original course into a new direction, dependent upon the refractive power of the material and the angles of its surfaces in relation to the course of the light.

We have thus two practical means by which to control the direction or course of light—reflection, by the use of catoptric reflectors or prisms; and refraction, by the use of a dioptric lens; the use of either or both in combination will depend upon the use to which the light is intended to be applied—or rather, in fact, upon the amount of deflection of the light necessary to be produced.

Artificial illumination for useful purposes may be broadly classed under two heads—first, signal lights; second, artificial light as a substitute for sunlight. Now, although it is my intention to treat more particularly of the second of these two divisions, yet as the application of lenses and reflectors has hitherto been more scientifically and successfully studied in relation to signal lights, and such application, after passing through years of practical experiment and use, having at last, in the modern "catadioptric" lighthouse light, reached a completeness that may be deemed almost if not absolute perfection, it may be advantageous to sketch out briefly the progress of science and invention in that form of artificial illumination, as a help to our consideration afterwards of the question as to how far the principles and means so successful in regard to signals may be practically applied with advantageous results in other uses of artificial illumination.

In its simplest form a signal light would be represented by a flame radiating its light into space in every direction, and consequently diminishing in intensity as the square of the distance increases; such, indeed, was the feeble characteristic of our lighthouses or beacons up to the beginning of the present century.

The first improvement made was the use of a parabolic reflector. This form of reflector, as you are aware, throws forward in parallel lines the reflection of a light placed in its focus, thus concentrating about one-half of the light into a single direction, but entirely obscuring the light in an opposite direction, so that if a fixed light was required to be visible over the entire radius of the horizon, or any large portion of it, a number of lights and reflectors would be required.

At the North Foreland Lighthouse, a lens was placed in front of each flame, in addition to the parabolic reflector; but these lenses, which had cost £50 each, were found to be useless in such a combination, and were removed in 1835; in fact, it is impossible to obtain any advantage by the use of a dioptric lens in conjunction with a parabolic reflector, as the direct rays of light impinge upon the lens at a different angle to that of the reflected rays, and hence one or the other must be dispersed beyond the required direction.

To return to our lighthouse illustration, we find that about the year 1822, Fresnel introduced in France the method of concentrating light for lighthouses by the method of refraction, using a dioptric lens of a novel but scientific form. The great advantage of this system was that, by dispensing with reflectors behind the flame or light, the light was visible round the whole horizon, so that one light only was now necessary, and far more of the light was utilized than by any previous method. Fresnel's admirable system has, however, been improved upon by the addition of prisms, acting by reflection placed above and below Fresnel's dioptric lens, intercepting and utilizing rays of light far beyond the power of a dioptric lens. Thus nearly the whole of the light produced is usefully employed by being compelled to travel in a plane parallel to the horizon. This is the form of lighthouse light known as the "catadioptric," from its combination of the powers of both reflection and refraction. It is now used in our best modern lighthouses. The diagram I have here represents the North Foreland Lighthouse, erected in 1858, and it is a system that may fairly be considered as the perfection of the application of reflecting and refracting lenses to signal illumination.

Having thus merely brought the leading principles and illustrations of this part of my subject before you, I have now to ask your attention to its second division—the use of artificial light as a substitute for sunlight; and in tracing the course of invention in relation to the use of lenses and reflectors as aids to this form of artificial illumination, I shall have to refer to many unsuccessful schemes, giving them, however, only sufficient attention to explain the cause of their inutility, and we shall meet with but few inventions or proposals which have achieved or even deserved success.

Allow me first to divide this branch of our subject into two distinct subdivisions—light used within an enclosed space, having reflecting surfaces, such as an ordinary room, and light used in an unenclosed space, in fact, open-air illumination.

The essential difference of these conditions must be familiar to you. You cannot fail to have noticed how a lamp or candle, which in a room or hall with light walls and white ceiling had appeared cheerful and brilliant, suddenly seemed to be deprived of its energy, and looked dismal and feeble when removed into the open air at night. The intensity of the light was the same—the circumstances under which it was burning alone had changed.

For ordinary indoor lighting the reflection of light by the walls and ceilings is usually sufficient, and ensures a fair and even diffusion of light throughout the space illuminated; shades are usually placed on lamps more to protect the eye from the direct rays emanating from the light than from any reflective power they possess; and when in the passages of public buildings, or in other places, silvered reflectors are placed behind the flames of wall-lamps, the effect is nearly always more dazzling than advantageous. It is, therefore, in the use of artificial light in the open air that the aid of lenses and reflectors is in fact required. We may take for an illustration an ordinary street-lamp; any improvements in such lamps will probably be useful in many other situations.

As in the case of the early form of signal light or beacon in the last century, so an ordinary street-lamp of this day radiates its light into space in every direction; some few of the rays may faintly illuminate the walls of adjacent houses, but in any case a very large proportion of the light produced is absolutely wasted. Long ago this fact appears to have attracted attention, and early in the history of street-lighting attempts were made to utilize the wasted rays of light. We find records of these efforts among the specifications at the Patent Office dating as early as 1791, when the first use of lenses in connexion with street-lamps appears to have been proposed. In 1793 two other inventions for the purpose are recorded; these seem to have been various and ineffective forms of the dioptric lens applied to the globular oil lantern.

Passing over the various improvements in the lanterns used for oil lighting, we come to the earliest form of street-lamp used in gas lighting in this metropolis. I have here a sketch of one of these from Lincoln's Inn Fields; these had solid metal roofs, probably originally polished or whitened in the interior, but now rusted and blackened. Even at their best they could have reflected to the ground only a very small amount of light, while they effectually prevented the adjacent buildings from being illuminated above the level of the lamp when the flame was placed at the usual height in the lantern. The first improvement in these gas lanterns was simply to roof the lantern with glass, as is the common practice at this day. These lamps certainly had a lighter appearance, and were at least not worse than their predecessors, except in their greater liability to breakage. Still, anything like a scientific application of lenses or reflectors to control the direction of the light was not—at least as far as I can ascertain—attempted, until Sir Goldsworthy Gurney obtained patents, in the years 1841 and 1842, for his improvements in regulating and dispersing light and heat. These, however, required the use of an Argand burner and glass chimney, and were not of a character suitable for the rough usage or careless cleaning usually given to a street-lamp, nor were they indeed specifically proposed for this purpose.

In 1854 we find a proposal by Messrs. Boggett and Pettit for the use of what they termed dioptric refractors. These were annular reflecting prisms, and their application, among many other purposes, was proposed as an improvement in street lighting. This was to be effected by dividing the ring into semicircles, and placing them on either side of the gas flame, at an angle of about 45 degrees. Either the cost of making these prismatic lenses, the danger of breakage from the heat of the flame, the practical difficulty of cleansing, or the very slight benefit to obtained by their use in this form, must have proved a sufficient reason for their not being adopted for use in street-lamps.

Reflectors, of parabolic and other shapes, have often been placed behind the flame in street-lamps; commonly two flames were used with two reflectors back to back between them, while, even recently, another form of this attempt at improvement has been the subject of experiment in Paris, where silvered glass globes, about 3 inches in diameter, some flattened on opposite sides, with two gas flames, and others flattened on three faces, with three gas flames, were fixed in the lanterns in the Place Vendôme. These experiments resulted in absolute failure; no increase of light was obtained, and the glass globes were fractured by the heat of the adjacent flames. Indeed, a successful result was impossible; and any form of solid reflectors intercepting the rays of light visible in the street in any direction is simply absurd, and wasteful in application to street-lamps.

We may now dismiss, with these few examples, any further consideration of arrangements of lenses or reflectors requiring to be placed inside the lantern; they would necessarily be in danger of damage or destruction by the flame used, and interfere seriously with the cleaning of the interior of the glass lantern, besides themselves requiring great care in cleaning and polishing, without which they would be useless.

Here then is the broad distinction between the application of lenses and reflectors upon the large scale of a lighthouse, where each single part can be separately cleaned, and a similar application of lenses and reflectors to so small an object as a street-lamp.

I must now invite your notice to some arrangements of reflectors which, forming part of the lantern or its glazing, appear to be free from some of the difficulties I have noticed, and which have for different purposes been successful in various degrees.

The simplest of these arrangements is the use of solid reflecting plates in the roof of the lantern. This, under various forms, has been the subject of many patents; it is, however, of use only when an increase of light is desired close under the lamp, and where, cutting off from adjacent buildings all the light above the level of the lamp is of no importance; but as a consequence of this concentration of light close under the lamp, this arrangement is entirely unsuited for ordinary street lighting, as, unless the lamps were placed much closer together than at present, the intervals of darkness between the lamps would, by comparison, be rendered darker. Examples of this principle may be seen at Primrose Hill, in the globular lamps there, but the result is anything but satisfactory.

Another form of solid reflecting roof may be illustrated by a diagram representing the large lanterns now in use in the London and South-Western Railway yards at Nine Elms. It is evident at a glance how small a part of the waste light is intercepted, and how little concentration even of that is effected. The inverted cones were, I believe, originally polished, but now are simple white surfaces, from which the light radiates freely in all visible directions. In this apparatus a glass tube or chimney is required to protect the reflecting cone. Some street-lamps of this character may also be seen in the Strand, opposite Exeter Hall, and it will readily be seen there how little aid is obtained from reflectors in this form and position.

Leaving the use of solid reflectors as valueless for general application, we turn to the next series of proposals—that in which the sheets of glass used in glazing the lantern are used also to divert the rays of light.

The first of these is the use of opal glass in the roof of the lantern. This, while acting chiefly as a solid reflector, and subject to its disadvantages, yet permits a small portion of the light to pass through its substance; but even this small quantity is radiated in all directions visible from the surface of the opal glass, so that little or no control is obtained of the intercepted rays. A few specimens of this system may be seen in Oxford Street, but it will require careful searching to discover them, or to see the difference between them and the other street-lamps at a slight distance, especially if the other lamps, not having been recently cleaned, present a very dull appearance.

We next have a suggestion for cutting the upper part of the side panes into lines and facets, something after the manner of a cut-glass decanter; the small advantage gained by this method was certainly not worth the cost.

A more scientific application of dioptrics was proposed in 1857 by Degrand, who obtained a patent for what he described as "lenticular glasses." These appear to be a modification or variety of the dioptric lenses introduced by Fresnel, and for calculating the forms to be given to the stride or waves of the improved glasses, the formula of Fresnel is especially referred to because of its accuracy. These glasses, among various other uses, were designed for street-lamps. I am not aware that the invention ever took a practical shape in this direction in England, and the great cost of manufacturing such delicate optical glasses in

thin sheets with sufficient accuracy and polish—and without either they must have been worthless—probably prevented their application to street-lamps.

Recently, another form of this application of the dioptric lens was experimented upon in Paris. In this case the lantern was a cylinder formed of thick glass panes, cast in the form of a dioptric lens, such as may be seen in some ship-lamps; the light was entirely obscured from direct view, and the plan was found upon trial quite unsuited for street purposes.

We have now traced the course of invention in street-lamps, beginning with the simple flame, as we did with the simple beacon light in the case of signal lights; and, passing through the stage of parabolic and other reflectors behind the flame, into the use of various forms of the dioptric lens, we arrive at the year 1871, without further progress in the application of lenses and reflectors to street lighting than the state of advance in signal illumination in 1822, when Fresnel introduced his dioptric improvements, and practically without any really useful application of the principles in reflection or refraction to this important public use of artificial light.

We have seen in the case of lighthouse lights how perfection in principle has been reached by the addition of the catadioptric or reflecting prisms to Fresnel's dioptric or refracting lenses; we have also seen how powerless the dioptric lens is to assist us in street lighting. Let us then consider these catadioptric prisms—these additions which have secured such good results in signal lights, and see how far their use may serve our purpose in street illumination.

We readily perceive their power to control the direction of light reflected by them, and how far beyond the range of a dioptric lens that power extends. We see also that they can be applied above the level of the flame, so as not to intercept in any direction the direct action of the light usefully employed; but the difficulties we find in their use are the cost of accurately shaped polished glass prisms, their weight, and the great trouble of cleaning them. How then shall we obtain the evident advantages their use might confer, and avoid these difficulties? The course is easy enough, as the action of a reflecting surface and a reflecting prism is identical. Use thin reflecting plates instead of prisms, and so obtain at once economy and lightness, and avoid the necessity of cleaning each separate reflecting plate, by enclosing each group of reflectors between plates of glass set in a metal frame.

I have here a specimen of the street-lamp now known as the catoptric lamp; this will serve to illustrate the manner in which these reflecting plates can be applied. The angles at which the reflecting plates are placed in this specimen are such that, while they intercept light radiating upwards through 53° of arc, they concentrate it within an arc of 15°; this gives sufficient dispersion of the reflected light over the dark intervals between the lamps in a street; by varying the angles of these reflectors we can perfectly control the direction of the reflected light. In appearance you perceive three points of light—first, the flame itself; then, through the group of reflectors at the side of the lamps, an inverted image of the flame; and in the group of reflectors in the roof, a second inverted image of the flame; this, from reflecting the edge of the flame, or rather the flame in a more concentrated shape, as viewed from the position of this group of reflectors, gives an image of the flame even more brilliant than the appearance of the flame itself.

The concentration of the light radiating through 53° of arc into a much smaller area gives this reflected light its brilliancy and penetrative power, as in the example of the modern lighthouse light. There, however, the rays of light are concentrated into parallel planes, and here we have them extented over such degrees of arc as the amount of concentration or diffusion we desire may necessitate.

This system of street lighting was introduced upon one side of Waterloo Bridge in November, 1871, and so satisfactory was the result that soon after both sides of the bridge were fitted with lamps of this description, and the daily press described its effect in terms of the highest praise.

Lamps exactly similar to the pattern before you are in operation in Moorgate Street and many other parts of this metropolis, and in the town of Southampton, the High Street, 1¼ mile in length, is entirely lit with them, and the brilliant appearance, the increased lighting power, and the even diffusion of light in that street has given the greatest satisfaction. Numerous other towns have these lamps on trial previous to a general adoption of the system.

It is obvious at a glance how different this application of reflectors for street lighting is to all which have preceded it, and how great is the variety of form and detail of which it is capable. Here we have a specimen with reflecting plates fluted vertically; no advantage in power is, however, obtained by it, and although the effect may be pleasing, its extra cost would perhaps prevent its use in ordinary street-lamps.

This question of cost brings me to the commercial question, whether the use of reflectors and lenses in street-lamps, admitting its practicability, is of sufficient advantage to warrant the increased cost of the lamps and apparatus and the possibly increased cost of maintenance, or whether we can balance the extra cost, or entirely save its annual equivalent by a saving in the amount of lighting material consumed, and yet give at the same time double the useful effect of the present lighting. Let us see. Here we have lamps of various patterns all burning gas from the same main, each at the rate of 5 feet of gas per hour. These street-lamp regulators are by Mr. Sugg, of Westminster, all carefully adjusted, and giving, as you see, even results. Now in this specimen of a catoptric lamp I have a regulator, allowing a flame to burn at the rate of 4 feet of gas per hour only. The great increase in lighting power is still apparent to you; and at least double the lighting power is given by this lamp, as compared with the others burning 5 feet of gas per hour. Here then is a saving of 20 per cent. in gas, or about 13s. per annum. This would actually pay the entire extra first cost of the lamp and reflectors in two years, and practically the cost of repairs has not been found to be much more than the cost of repairing an ordinary lamp.

The question of cost cannot, however, be considered as if our present street lighting was so satisfactory that no improvement was desirable or necessary. The want of efficient street lighting in our cities and towns is an acknowledged grievance of long standing. London has been declared to be the worst lit city in Europe, and every one must admit the dangerous darkness which prevails in streets without shops, or after the shops are closed in others, and we depend only upon the public lamps for illumination.

How, then, is this defective lighting to be remedied? How are we to obtain at least double the present lighting (and less than double will not be satisfactory)? Will the authorities be induced to double the number of lamps we have at present? It seems hardly probable, when such an outcry is raised against a few shillings per lamp increase in the cost of gas, or when we remember that in 1866, according to a parliamentary report, there were about 40,000 public lamps in the London district alone, costing, at the present average of £4 per lamp, £160,000 per annum, while we cannot fairly estimate the total number of open-air lamps in this country at less than 300,000.

It is therefore, I think, obvious that it is in the use of reflectors, properly constructed and applied, which will in reality utilize to our advantage the hitherto wasted light, and which are of such a practical nature as to be fit for the rough work of public use, that we must look for immediate relief from the prevailing street darkness.

The use of such means, for not only doubling the present lighting power of our street-lamps, but also ensuring a more equal diffusion of light over the whole course of our streets, would be a boon worth paying even an extra cost for; but when these advantages can be actually obtained without extra cost, as I have shown it may be, then, slow as the introduction of any improvement ever seems to be, strong as may be the power of prejudice or of interest, or powerful for resistance as mere apathy or indifference may prove, it seems difficult to believe that the increased street lighting demanded by the public can long be refused to them by their representatives when the power of obtaining that increase on such terms—an increase that means better protection to life and property—is absolutely and practically at hand.

AIR GASLIGHT COMPANY.—The *Standard* of Monday, June 16, says that at at a meeting of the Air Gaslight Company, held on Saturday, a proposal in favour of the appointment of a committee of investigation was lost, whereon a poll was demanded, which will take place on Tuesday (this day).

ADVANCES IN THE PRICE OF GAS.—At the meeting of the Finance Committee of the Dundee Gas Commission, on the 2nd inst., it was resolved to recommend that the price of gas be raised from 4s. 2d. to 6s. At Uckfield (Sussex) the price has been raised from 6s. 8d. to 7s. 6d. per 1000 cubic feet. At Bradford the price has been raised by the corporation from 3s. to 3s. 6d. At Perth the commissioners have raised the price from 5s. 10d. to 7s. 6d. The following advances have also been made:—York, from 2s. 6d. to 3s. 4d.; Grangemouth, from 6s. 8d. to 7s. 6d.; Leominster, 4s. 2d. to 5s.; Leighton Buzzard, 5s. 5d. to 5s. 10d. At Holbeach there has been an advance of 10d., and at Wisbeach the price has been increased to 5s. 10d.

PERTH GAS COMMISSION.—At a meeting of the Gas Commissioners, last week, it was agreed to raise the price of gas from 5s. 10d. to 7s. 6d. per 1000 cubic feet. A long discussion took place as to whether the practice should be continued of giving 10d. discount per 1000 feet to consumers of 100,000 feet and upwards; the subject was deferred. From a statement of the revenue and expenditure of the commissioners from May, 1872, to April 30, 1873, it appeared that the revenue amounted to £11,355 7s. 3d., and the expenditure to £11,053 19s. 1d. It was agreed to give the manager, Mr. Whimster, £40 a year in lieu of house, coal, and gas. His salary is now £365.

EXPLOSION AT RAGLAN BARRACKS.—Raglan Barracks, Devonport, the largest barracks in England, narrowly escaped destruction by fire on Thursday, originating in a serious gas explosion. Gas was smelt strongly in one of the chief rooms, and the sergeant in charge directed a soldier to ascend to the ceiling and apply a light to the spot where the pendant hung. Instantly a violent explosion was heard through the whole barracks. The man applying the match was thrown down, and a sergeant and three other men dashed against the wall, much bruised and cut. All the windows were blown out, the flooring boards torn up, the ceiling demolished, and the furniture destroyed; but, strange to say, the gas did not fire the building. The injured men were removed to the hospital.

AMERICAN GAS STATISTICS.—In November last the Newhaven (Conn.) Gaslight Company issued a circular letter addressed to the other gas companies in the United States, expressing a desire to ascertain what ratio exists between the consumption of gas and the population of any given locality, with a view to determine whether there is any general law which may serve as a guide in determining the probable future demands for gas supply and storeage capacity. They, therefore, asked that each of the companies addressed would furnish them with their census population in each of the decades 1850, 1860, and 1870; and also state the aggregate consumption of gas furnished by them in each of those years, as well as the largest consumption in any one day of 24 hours in each of the same years. From a circular issued by the same company dated the 20th ult., we learn that "replies, varying greatly in definiteness, were received from 21 companies in various parts of the country. Several of these were given as confidential, so that their publication was precluded. The result of the inquiry was unsatisfactory, the extremes of reported consumption having varied from 2⅜ to 10⅝ cubic feet per individual in the ascertained or estimated population of different localities, while a mean was about 5½ cubic feet. So far as any results were deduced from the inquiry, they led to the conclusion that the ratio of consumption to population is subject to so many contingencies not capable of mathematical statement as to render the question one of local rather than general determination."

BOSTON PUBLIC LIGHTING.—At the monthly meeting of the local board, on Tuesday, the 3rd inst., the clerk read a reply from the gas company to the decision of the last meeting of the board. It was to the following effect:—That they will light the public lamps by average meter indication—one meter to every tenth lamp—for 12 months from the 1st of August; that the meters must be wet ones and be buried in the ground, be purchased by the board, and inspected by the company; that the company considers that the board, in wishing to take the lighting and extinguishing of the lamps into their own hands, have imported a new element into the discussion, which they cannot admit; that they will light and extinguish as heretofore, for which they will charge 7s. 6d. per lamp, leaving the board to put up, take down, repair, and paint the lamps; and that in the event of the metage system not being satisfactory to the company, they will give the board notice three months before the expiration of the lighting contract that they must either provide meters for every lamp or abandon the metage system altogether. Alderman Wright moved—"That the offer of the gas company be accepted subject to the following conditions: Firstly, that the amount paid per 1000 feet for gas be not more than what is paid *ceteris paribus* by the Great Northern Railway Company, or any other consumer; and, secondly, that the gas company be offered such a sum as may be agreed upon for the whole management and repair of each lamp, instead of 7s. 6d. for lighting and extinguishing only, as in the opinion of a joint committee of both boards may be deemed desirable, and also that the question of dry or wet meters, and the mode of fixing the same, with all other details, be left to the same committee, and subject in all cases to the ratification of a meeting of this board." Mr. Dyer seconded the motion, which was carried.

BIRMINGHAM WATER SUPPLY.—Dr. Hill, the medical officer of health for Birmingham, reports that the water supplied to that town for the month of May was turbid from large suspended particles, and that the proportion of organic nitrogen had increased.

GLASGOW WATER SUPPLY.—Professor Bischof, of the Andersonian University, Glasgow, reports that the total solid impurity in 100,000 parts of the water supplied to that city, during the month of May, from Loch Katrine amounted to only 3·16 parts; that the water had less than one degree of hardness, and was quite free from evidence of previous animal contamination.

AYR WATER COMPANY.—On Wednesday last a special meeting of the shareholders was held to consider the Ayr Burgh Bill at present before Parliament, which provides for the transfer of the company's undertaking to the Corporation of Ayr. Mr. Hugh Cowan, the chairman of the company, presided, and moved that the bill be approved of. He thought the transaction would be a very fair one, both for the shareholders and the corporation. The motion was unanimously agreed to.

DUNDEE NEW WATER SCHEME.—At a meeting of the Dundee Water Commission, on Thursday last, it was agreed to carry out the construction of certain new water-mains, in order that there might be a fuller and better distribution of water throughout the whole town. A report was laid on the table from the engineers of the new water scheme, in which they reported, in answer to questions put to them, that a regulating or equalizing reservoir on the line of pipe track between Newtyle and Dundee, though not absolutely necessary for the due supply of the town, would still be attended with many advantages, and that it would be advisable, while laying out the pipe track, to make provision for its future construction. The site proposed was at Clatto Muir, a little to the south of Baldragon station. The reservoir should be capable of holding a week's supply, and would cost £15,000. It was resolved to ask the engineers to lodge separate estimates for the whole works proposed to be altered, if these works were considered necessary.

EDINBURGH WATER SUPPLY.—At a special meeting of the Town Council, on Tuesday last, the report of the Lord Provost's committee on the subject of the water supply came up for consideration. The Lord Provost urged the necessity of some steps being taken to free the Water Trust from its present difficulties, and stated that he had requested Mr. Leslie to estimate the cost of bringing in an additional supply from the Lyne and the Glencorse valley at present prices. Mr. Leslie had replied, estimating that from the two sources 7 million gallons of water per day could be obtained, at an outlay of £390,700, which would raise the whole rate for water purposes to 10d. in the pound. The Lord Provost further expressed the opinion that it would be desirable for Edinburgh to separate from Leith and Portobello with reference to the water supply, inasmuch as an unfair proportion of rates was at present paid by Edinburgh. Finally, he moved that the report should be remitted to the Lord Provost's committee to consider what the future action of the council in regard to the water supply should be. Baillie Marshall seconded the motion, which, after some criticisms from Mr. Gowans on the Lord Provost's remarks, was agreed to.

SANITARY AND EDUCATIONAL EXHIBITION.—In connexion with the Social Science Congress, to be held at Norwich, from the 1st to the 8th of October next, there will be an exhibition of educational, sanitary, and domestic appliances, based on the experiment which proved so successful at Leeds, in 1871. The large and spacious Drill Hall has been placed at the service of the Social Science Association (with the sanction of the Government) by the commanding officer. The object of the exhibition is to bring under the notice of the public generally, and particularly those who are interested in social, sanitary, and educational questions, the latest scientific appliances for improving the public health and promoting education. Among these may be mentioned—All matters relating to house construction, connected with which are building materials, light, warming, ventilation, and interior ornamentation; flues, fireplaces, stoves, boilers, furnaces, gas apparatus; cisterns, baths, piping, filters, fountains, lavatories, and all things connected with the supply and use of water; drain-pipes, tubes, sinks, traps, troughs, closets, urinals, filters, and all plans, diagrams, sections, models, and specimens of sewage and drainage contrivances; cooking apparatus and food manufacturing machines, culinary utensils, specimens of food, adulterations, condensed fluids, preserved meats, light and cooling beverages; disinfectants, deodorants, antiseptics, and other things relating to the prevention of disease and preservation of health; hygiene in clothing and dress; plans and models of school-buildings, forms, desks, books, maps, and other articles used in teaching; and all sorts of appliances appertaining to the advancement of sanitary science, the promotion of education, and the improvement of the health and domestic comfort of the community at large. The exhibition will be open to exhibitors from all parts, and the management will be under the superintendence of a committee. A mere nominal charge will be made for space and admission—just sufficient to cover the costs of preparation and defraying the working expenses.

Register of New Patents.

2453.—EMMENS, S. H., Old Jewry, London, "*Improvements in apparatus for producing heat and light.*" Patent dated Aug. 16, 1872.

This invention relates, first, to the employment, as fuel, of the vapours or spray of inflammable liquids or viscid substances combined with atmospheric air or other oxidizing gas in such a manner that no explosive mixture is formed until the moment of combustion; secondly, the creation of an automatic supply of such fuel or illuminating agent; and, thirdly, the construction of heating and lighting apparatus based upon the foregoing features.

2576.—SPENCER, G., Cannon Street, London, "*Improvements in the purification of coal gas used for illuminating purposes and for mechanical purposes, and in apparatus therefor.*" A communication. Patent dated Aug. 30, 1872.

These improvements consist in a new mode of rendering gas made from bituminous coals and similar substances to its proper condition by friction, thereby securing greater economy in the purification. This is effected by the introduction of mechanical appliances into a series of pipes, as set forth in the drawings attached to the specification, without the aid of which drawings the invention cannot be further described.

2800.—PORTER, J. T. B., Lincoln, "*Improvements in combined gas apparatus to be used on board ship.*" Pated dated Sept. 21, 1872.

This invention consists in a combination of gas apparatus, to be used on board ship, of conical retorts having upper and lower connected outlet-pipes and dip-box for superfluous oil; and fitted with concave and convex discs, on to which discs oil and water are fed by cocks regulated by the motion of a combined gasholder and tank, and being heated in pairs from single furnaces and connected with a washer and condenser, the whole being arranged and worked together.

2841.—SUGG, W. T., Vincent Street, Westminster, "*Improvements in apparatus for regulating the supply of gas.*" Patent dated Sept. 26, 1872.

This invention has reference to modifications of inventions for which letters patent have been granted to the present inventor, and consists in making two or more radial holes in the valve-spindle a little above the valve, these holes or channels having connexion with a hole through the centre of the spindle in the direction of its axis, or a communication may be made between the under and upper sides of the diaphragm. Another modification consists in inserting the regulating valve in the outlet instead of the inlet, attaching it to the upper side of the diaphragm, and providing it with holes similar to that described.

2855.—M'KELVIE, J., Edinburgh, "*Improvements in the manufacture of illuminating gas.*" Patent dated Sept. 27, 1872.

This invention consists in a mode of treating peat, turf, or bog, and oleaginous substances, in order to obtain gas therefrom. These substances (which it is preferred to employ in somewhat large pieces) are thoroughly soaked in or with one or more oleaginous substances, and allowed to remain in any suitable place until the free oleaginous substance or substances drip or fall from it; it is then ready to be placed in a gas-retort.

2976.—FISHER, W. D., Glasgow, "*Improvements in apparatus for and connected with the manufacture and use of illuminating gas, parts of which are applicable to other purposes.*" Patent dated Oct. 10, 1872.

This invention has reference to an improved construction and compact arrangement of the parts of a gas-making apparatus for private illuminating purposes, and consists, as regards the retorts, in making them with a hollow sole longitudinally, so that the liquid or tarry products of the coal or shale used would run to the centre of the furnace to be distilled into gas also; and when used for producing gas from liquid hydrocarbons, as petroleum and shale oil, or the residue in refining them, the hearths of these retorts are made with angled ducts, so that the oil would enter at one end of a gutter and be reversed at the other, so as to run through a second, third, or fourth time, thus being converted into gas before reaching the far end. The doors of these retorts being fixed and actuated by a new lever arrangement hinged at one side, which would tighten up the ordinary luted doors by a wedge-piece on the back of the door, the other or handle end of the lever entering a long wedge-tightening sneck, and when the doors are made with smooth metal faces, they might be attached to the levers and tightened up in the tapered snecks only; and this long handle or lever would, by another improvement, be connected by a toggle-joint arrangement of levers, so as to work a long rod and scraper in the outlet gas-pipe through a stuffing-box in its upper end, which scraper would also form a valve for closing the pipe when the door was open. The scraper is drawn back beyond the branch leading the gas through an angled conducting-pipe, with a hinged cleaning-door opposite to it, which is weighted so as also to form a safety-valve. This angled conducting-pipe is led down to join the lower end of the first of two or more current-reversing and cooling or condensing-pipes, the lower ends of which are made to dip into a condensing residuary trap or plain vessel, with divisions or separate vessels between the dip-pipes, and a spout or duct to allow the residues to run off and maintain the liquid at the same level, so as to allow all the residues to run into the trap, and yet admit of the gas passing on to the purifier, and then to the gasometer or holder without passing through the trapping liquids, or a hydraulic main; a cock, however, being put on the branch leading to the gasholder, beyond the last dip-pipe leading from the purifier. The purifiers are of the ordinary construction of perforated trays with lime, placed over each other, but by these improvements their shells or vessels are preferred to be made of glazed fire-clay or earthenware, or if made of iron they are enamelled or glazed, as well as the conducting-pipes near the retort, to make them easily cleaned, having these conducting and cooling or condensing pipes and purifiers either immersed in a cold water cistern, or an air refrigerating duct, kept cool by the cold air being led through it to the furnace of the retort. When the gasholders are made of the heavy iron, or water-luted, or dry collaping class, they are, by another improvement of this invention, hung by a fusee and drum on one spindle, having each chain of the gasholder wound round either of these in one direction, and the chain of the counterweight wound round the other in the opposite direction to that of the fusee, the one being fully wound on when the other is nearly unwound, all so that the power and action of the weight would increase or diminish in proportion to the weight of the gasometer in its rising and falling respectively. Another improvement consists in making a simple collapsing gasholder, which would be very light and always the same weight in all positions, the lower half being composed of a round or other shaped rigid vessel, having a flexible bag part for the upper half, made of oilcloth or other flexible web material, which would not allow the gas to pass through it, having the one edge secured gas-tight all round the edge of the lower half of the vessel, and the other edge to the edge of a rigid lid, small enough to work up and down into the lower half or vessel, the lid being guided vertically by rollers, or any ordinary suitable guides, or by a rod or rods inside or outside the gasholder. Another improvement consists in carbonizing a portion of the gas, when of a poor quality, before entering the holder, or a certain proportion of air, and mixing it with the gas in the holder, by blowing the air either through perforated pipes in a vessel of naphthaline or other liquid hydrocarbons, which would so carbonize these; and in the improvement of applying the upward force of the gasholder to work the piston of such blower for forcing the air; also in making the motion of the holder give an alarm, or shut the damper of the gas-making furnace when the holder was nearly full. Another improvement consists in a new simple mode of jointing the pipes of gas apparatus (also applicable for jointing water and steam pipes generally), and consists in making the extreme ends of the pipes close to the abutting joints of a reverse double truncated cone-shape with a groove and shoulder beyond, over which a roll or layer of soft metal, or other ordinary packing, is slipped or wound, and a conical metal thimble or rim driven or screwed up over it, so as to tighten the packing over the joint and reverse conical parts to hold the ends of the pipes together.

3005.—LOWE, C., Reddish, Lancaster, "*Improvements in the treatment of coal gas tars for the purpose of obtaining certain useful products therefrom.*" Patent dated Oct. 11, 1872.

This invention relates to obtaining carbolic, cressyllic, and other acids from London coal tar, or similar substances.

3008.—FERRIE, W., Airdrie, N.B., "*Improvements in applying combustible gases obtained from smelting furnaces, or from gas producers, for heating puddling and other furnaces, and in apparatus connected therewith.*" Provisional Protection only obtained. Dated Oct. 12, 1872.

The first part of the invention consists in arranging scrapers inside the pipes, ducts, or passages, through which the gases pass, such scrapers being worked continuously or intermittently by means of steam-engines. It is also preferred to heat the gases so that the condensation of vapour may be prevented. In applying the combustible gases for heating puddling or other reverberatory furnaces, flues are constructed beneath the reverberatory chamber, such flues being arranged in vertical sets beside each other, whilst each flue is led horizontally forwards and backwards in forming a vertical set to whatever depth or number of traverses may be found desirable in practice. The heat of the exhaust gases will be to some extent communicated through the sides of the flues to the combustible gas and to the air. To still further heat the air, other flues are provided on the outer sides of the air flues, and into these flues portions of the combustible gases are admitted and ignited.

3082.—SWEET, A., Hampstead Road, "*A new and improved water-waste preventing apparatus to be used for flushing closets and other like purposes.*" Provisional protection only obtained. Dated Oct. 18, 1872.

The object of this invention is to retain the full pressure given on the main service upon the water to be ejected after it has passed the waste-preventing apparatus, which can be fixed in any convenient place, not as at present above the seat or place to be flushed, but either above or below, or at any distance from it. The apparatus consists of a floating piston which rises to the top of the cylinder in virtue of its lightness, and descends by the pressure of the water from the main. Through this cylinder, or in any convenient way, a passage is made to connect the water above and below the piston. To this piston is also attached a plug, having its seat at the bottom of the cylinder or box, and covering the mouth of the outlet-pipe. In this plug, or at any other convenient place, a small hole or pipe is placed so as to connect the water in the cylinder with the water in the outlet-pipe. The cylinder has a top and bottom cover, and is hermetically fastened up, the floating piston being without any communication with the external parts. This valve is self-acting. On turning or opening the outlet cock or valve it depends for its perfect action upon the pressure being relieved and equalized by connecting the separate water compartments.

APPLICATIONS FOR LETTERS PATENT.

1915.—FLOOD, W. C., Battersea, Surrey, "An improved meter for water and other liquids." May 28, 1873.

1917.—KIDD, J., Leadenhall Street, "Improvements in air or vapour gas machines and in apparatus connected therewith." May 28, 1873.

1922.—LAKE, W. R., Southampton Buildings, London, "An improved method of and apparatus for generating vapour from bisulphate of carbon." A communication. May 28, 1873.

1967.—TOWNSEND, J., Glasgow, "Improvements in treating sewage or other liquids or substances containing nitrogen, phosphorus, or their compounds, in order to deodorize or precipitate the same and obtain useful products therefrom." May 31, 1873.

2000.—BAGGS, I., High Holborn, "Improvements in the manufacture of gas and gases for illuminating and other purposes, and in apparatus to be employed in connexion therewith." June 4, 1873.

GRANTS OF PROVISIONAL PROTECTION.

371.—Lake, W. R., Southampton Buildings, London, "Improvements in fire-alarm and water-supply apparatus for preventing conflagrations." A communication. Jan. 30, 1873.

1579.—Davies, P. J., Hornsey, Middlesex, "Improvements in apparatus for controlling, regulating, measuring, and arresting the flow or discharge of fluids or liquids, and preventing waste thereof." May 2, 1873.

1794.—Bousfield, G. T., Sutton, Surrey, "Improvements in motive-power engines to be worked by steam or other fluid, applicable also to meters and pumps." A communication. May 16, 1873.

1799.—Caffall, R. M., Alton, Hants, "Improved means of and appliances for automatically preventing the back rush of gas from gasometers, for purifying the gas, and for improving the brilliancy of the lights or flames of gas." May 17, 1873.

1805.—Hammett, S. H., Southwark, "Improved apparatus for regulating the supply of water to water-closets and other places." May 19, 1873.

1807.—Telling, W. A., and Johnson, S., Wood Green, "Improvements in gas-meters." May 19, 1873.

1834.—Newton, H. E., Chancery Lane, "Improvements in hydraulic engines for raising water and for obtaining motive power." A communication. May 20, 1873.

1852.—Imray, J., Southampton Buildings, Chancery Lane, "Improvements in apparatus for supporting respiration and light in suffocating atmospheres and under water." A communication. May 22, 1873.

1853.—Orsat, L. H., Paris, "An improved apparatus for analyzing gas." May 22, 1873.

1859.—Lake, W. R., Southampton Buildings, London, "Improvements in gas purifying and regulating apparatus." A communication. May 22, 1873.

1887.—Fox, W. W., Gas-Works, Crayford, Kent, "Improvements in apparatus used in the manufacture of gas." May 26, 1873.

1894.—Spencer, W. H., New York, "Improvements in the process of and apparatus for manufacturing illuminating gas." May 26, 1873.

1915.—Hood, W. C., Battersea, Surrey, "An improved meter for water and other liquids." May 28, 1873.

1917.—Kidd, J., Leadenhall Street, "Improvements in air or vapour gas machines and in apparatus connected therewith." May 28, 1873.

NOTICES TO PROCEED.

314.—Girdwood, R., Edinburgh, "An improved portable apparatus for illuminating by means of gas." Jan. 27, 1873.

713.—Barlow, J. R., and Walsh, R., both of Bolton, "Improvements in apparatus for distributing water for extinguishing fire and for other purposes." Feb. 26, 1873.

1471.—Baggs, I., High Holborn, "Improvements in the manufacture of gas for illuminating and other purposes, and in apparatus connected therewith." April 23, 1873.

1799.—Caffall, R. M., Alton, Hants, "Improved means of and appliances for automatically preventing the back rush of gas from gasometers, for purifying the gas, and for improving the brilliancy of the lights or flames of gas." May 17, 1873.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

3670.—Scott, H. Y. D., Ealing, Middlesex, and Scott, T. W., of the same place, "Improvements in the mode of and apparatus for preparing lime for the treatment of sewage." Dec. 4, 1872.

3728.—Shedlock, J. F., and Shedlock, J. J., Harrow Road, Middlesex, "Improvements in the lighting of towns and districts, and apparatus connected therewith." Dec. 9, 1872.

3735.—Jaynor, A., Regent's Park, London, "Improvements in the construction of automatic telegraphs, to be worked by air, steam, or gas." Dec. 9, 1872.

3755.—Scott, H. Y. D., Ealing, Middlesex, "Improvements in the treatment and utilization of sewage water." Dec. 11, 1872.

3766.—Gedge, W. E., Strand, Middlesex, "A new or improved motive-power engine actuated by soluble gases." A communication. Dec. 12, 1872.

3795.—Edwards, W., Holloway, Middlesex, "Improvements in rotary pumps." Dec. 14, 1872.

3866.—Kennelly, T., Birmingham, "Improvements in blow-pipes used in soldering and brazing metals and for other purposes." Dec. 20, 1872.

768.—Parlby, W., Aylesbury, "Improvements in the construction and manipulation of apparatus used in the manufacture of gas." March 3, 1873.

807.—Wise, W. L., Adelphi, "An improved air gas apparatus, with injector for the self-regulating production of gas from volatile fluids." A communication. March 5, 1873.

846.—Skoines, H., Argyle Street, King's Cross, "Improvements in the manufacture of gas and in the treatment of the residues therefrom, and in the combination of gases for the production of light and heat, and in the apparatus employed therein." March 8, 1873.

1244.—Thomas, A., Gas-Works, Alton, Hants, "Improved means of and appliances for relieving gas-retorts from pressure, and for hermetically sealing the joints of hydraulic mains of gas-works." April 3, 1873.

1252.—Wise, W. L., Adelphi, "Improvements in rotary pumps." A communication. April 4, 1873.

1287.—Rowland, T. F., Greenpoint, New York, "Improvements in apparatus for supplying and measuring coal and charging and emptying gas-retorts." April 8, 1873.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

1180.—Lungley, C., "Improvements in the manufacture and in the securing of tubes, taps, and plugs in boilers and other vessels, also in certain modes of regulating and stopping the flow of liquids, gases, or air into or from such vessels." April 22, 1870.

1227.—Alden, C. W., "Certain new and useful improvements in pipe-wrenches." April 28, 1870.

1240.—Barlow, V., "An improved apparatus for regulating the pressure of gas in gas-burners." April 30, 1870.

1295.—Ripley, A., "A new or improved pipe-wrench." May 6, 1870.

1335.—Lake, W. R., "Improvements in apparatus or machinery for making gas from liquid hydrocarbons for illuminating purposes." May 10, 1870.

1342.—Crouzieres, J., "An improved gas and water tight joint to pipes and tubes." May 11, 1870.

1485.—Benson, M., "Improvements in the mode of supplying lamps with atmospheric air for supporting their illuminating flames." May 23, 1870.

1514.—Thomas, G., "Improvements in the construction of gas-stoves." May 25, 1870.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £100 BEFORE THE EXPIRATION OF THE SEVENTH YEAR.

1351.—Austin, W., "Improvements in joining pipes and tubes." May 11, 1866.

1410.—Bernard, J., "Certain improvements in generating and heating steam, gas, and vapours, and in the machinery or apparatus employed therefor." May 18, 1866.

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English and Foreign Agents:

JAMES MILLER, SON, & CO.,

9, GRACECHURCH STREET, LONDON, E.C.,

AND

75, UNION STREET, GLASGOW.

Share List

OF

Metropolitan Gas and Water Companies.

(Corrected by Mr. F. N. Golding, Sun Court, Cornhill, from the latest Stock Exchange Quotations.)

Number of Shares issued.	Amount per Share.	Name.	Amount paid up p. Share.	Dividend p. Cent. p. Annum.	Latest Quotations.
	£	GAS COMPANIES.	£ s. d.	£ s. d.	£
8000	20	Anglo-Romano	20 0 0	10 0 0	20 — 22
5000	20	Bahia (Limited)	20 0 0	3 0 0	10½ — 11½
1000	20	Do., preference	20 0 0	10 0 0	25 — 27
750	20	Do., do., redeemable	20 0 0	10 0 0	22 — 24
40000	5	Bombay (Limited)	5 0 0	6 15 0	5½ — 6
10000	5	Do., third issue	4 0 0	6 15 0	1 —1½ pm.
10000	20	British (Limited) (Norwich, Hull-Sculcoates, Hanley, Tunstall & Shelton [Potteries], Trowbridge., and Holywell.)	20 0 0	10 0 0	32 — 34
7500	20	Cagliari (Limited)	20 0 0	7 0 0	15 — 16
160000	10	*Chartered* A shares	10 0 0	10 0 0	14¼ — 15
20000	10	Do., A	4 0 0	10 0 0	2⅜—2⅝ pm.
10000	10	Do., B shares, 4 per cent. max.	10 0 0	4 0 0	6⅞— 7¼
25000	10	Do., 5 per cent. preference	10 0 0	5 0 0	12½ — 13
20000	10	Do., 5 per cent. preference, second issue	8 0 0	5 0 0	12⅝— 12⅞
20000	10	Do., 10 per cent. preference	10 0 0	10 0 0	19 — 20
12000	25	Do., D shares	25 0 0	10 0 0	48¾ — 49½
17490	100	*Commercial*	100 0 0	10 0 0	154 —157
20000	20	Continental Union	20 0 0	8 0 0	20¼— 21½
10000	20	Do., new	10 0 0	8 0 0	¼—½ pm.
10000	10	Do., new, 1872	2 10 0	8 0 0	par—¼ pm.
10000	20	Do., preference (Grmny.: Strsbg. France: Cette, Nismes, Montargis Vienne, Roanne, Beaucaire, Rueil, Albi. Italy: Milan, Genoa, Parma, Modena, Alessandria, Messina.)	20 0 0	7 0 0	24 — 26
5000	10	*Crystal Palace District*	10 0 0	10 0 0	15 — 16
5000	10	Do., preference	10 0 0	6 0 0	11½— 12
10000	10	Do., new shares	10 0 0	7 0 0	11 — 12
23406	10	European (Limited)	10 0 0	8 0 0	13½ — 14
12000	10	Do., new shares (Boulogne, Amiens, Rouen, Caen, Havre, & Nantes.)	5 0 0	8 0 0	2 —2½ pm.
4054	10	Foreign and Colonial (Limited)	10 0 0	..	10 — 10½
5000	10	Hong Kong (Limited)	10 0 0	10 0 0	13 — 13½
1560000	100	*Imperial*	100 0 0	10 0 0	159 —161
26000	12½	Do., new shares	12 10 0	7 0 0	15 — 15½
1300	100	Do., bonds	£100	10 0 0	195 —200
56000	50	*Imperial Continental* (Amsterdam, Berlin, Ghent, Hanover, Lille, Rotterdam., Aix-la-Chapelle, Antwerp, Bordeaux, Brussels, Cologne, Frankfort-on-Maine, Haarlem, Stolberg, Toulouse, & Vienna.)	43 15 0	9 2 6	59 — 61
3000	40	*Independent*	40 0 0	10 0 0	64 — 66
3000	10	Do.	10 0 0	5 0 0	7⅛— 8⅛
3000	20	Do.	20 0 0	7 10 0	24½— 25¼
	10	Do., D	1 0 0	..	
250000	Sk.	*London*	100 0 0	10 0 0	153 —156
£15000	Sk.	Do., 1st preference	100 0 0	6 0 0	117 —120
	Sk.	Do., 2nd preference	100 0 0	6 0 0	
	Sk.	Do., 3rd preference	100 0 0	6 0 0	
£18781	100	Do., 1st preference stock	100 0 0	6 0 0	
£11828	100	Do., 2nd preference stock	100 0 0	5 0 0	
15000	5	Malta and Mediterranean (Limited)	5 0 0	5 0 0	3¼— 3⅞
6000	5	Do., preference	5 0 0	7 0 0	5⅛— 5⅜
20000	5	Mauritius (Limited)	2 0 0	7 0 0	2 — 2⅛
25000	20	Monte Video (Limited)	20 0 0	..	24 — 24½
8000	10	Nictheroy, Brazil (Limited)	10 0 0	..	2⅜—2 dis.
30000	5	Oriental (Calcutta)	5 0 0	9 0 0	6⅞— 7⅛
30000	5	Do., new shares	2 10 0	9 0 0	¾—1¼ pm.
10000	5	Ottoman (Limited)	5 0 0	nil.	1⅞— 2⅛
17500	10	Pará (Limited)	10 0 0	7 0 0	9 — 10
27000	20	*Phœnix*	20 0 0	10 0 0	31½— 32½
3600001.	100	Do., new	45 0 0	7 10 0	12—14 pm.
144000l.	Sk.	Do.	100 0 0	5 0 0	90 — 92
5000	20	*Ratcliff*	20 0 0	10 0 0	31 — 32
34000	20	Rio de Janeiro (Limited)	20 0 0	10 0 0	36 — 38
7359	5	Singapore (Limited)	5 0 0	7 10 0	4⅛— 5
2000	5	Do., preference	5 0 0	7 10 0	5⅛— 6
1500	32½	Shanghai	32 10 0	12 0 0	30 — 32
4000	50	*South Metropolitan*	50 0 0	10 0 0	83 — 85
4000	12½	Do.	12 10 0	10 0 0	19 — 20
20000	12½	Do., new shares	2 10 0	10 0 0	3½—4 pm.
15000	10	*Surrey Consumers*	10 0 0	10 0 0	15½— 16
10000	10	Do., new	7 0 0	10 0 0	4⅛— 4⅜
9000	4	United General (Limerick)	4 0 0	5 0 0	1⅛— 1⅜
1500	10	*Wandsworth and Putney*	10 0 0	10 0 0	14 — 15
1500	10	Do.	10 0 0	7 10 0	11 — 12
2957	10	Do.	10 0 0	7 0 0	
993	10	Do.	3 0 0	7 0 0	
16000	5	*West Ham*	5 0 0	10 0 0	7⅞ — 8⅛
10000	5	Do., new shares	1 10 0	10 0 0	3—3¼ pm.
		WATER COMPANIES.			
60000	10	Berlin	10 0 0	11 10 0	17½— 18⅜
12000	100	Chelsea	100 0 0	6 0 0	117 —119
18000	100	East London	100 0 0	6 0 0	122 —124
10000	50	Grand Junction	50 0 0	8 10 0	79 — 81
5840	25	Do., ¼ shares	25 0 0	8 10 0	39 — 40
2160	25	Do., new do.; maximum dividend, 7½ per cent.	25 0 0	7 10 0	33 — 35
4396	100	Kent	100 0 0	6 0 0	121 —123
5339	100	Lambeth	100 0 0	6 5 0	121 —123
1161	100	Do.	20 0 0	6 5 0	
442	100	New River	100 0 0	8 0 0	170 —180
4443	100	Do.	20 0 0	8 0 0	36 — 38
4000	100	Do., debenture stock, 4 per cent.	100 0 0	4 0 0	96 — 98
3036	100	Southwark and Vauxhall	100 0 0	5 10 0	105 —107
1296	100	Do., preference stock	100 0 0	5 0 0	100 —102
	100	Do., D shares	100 0 0	5 10 0	102 —104
		Do., G shares	..	4 10 0	
	100	Do., new ordinary	..	4 10 0	
1600	100	Do., new ordinary, No. 1	40 0 0	4 10 0	
13913	61	West Middlesex	61 0 0	£6 per sh.	120 —122

BEALE'S IMPROVED PATENT GAS-EXHAUSTERS,

WITH

GWYNNE & BEALE'S

PATENT

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Mr. BEALE,

The oldest Maker, Inventor and Patentee of

GAS-EXHAUSTING MACHINERY.

It is NOT CORRECT to state that Mr. BEALE has RETIRED.

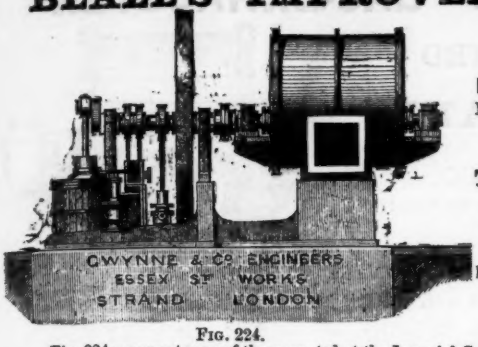

FIG. 224.

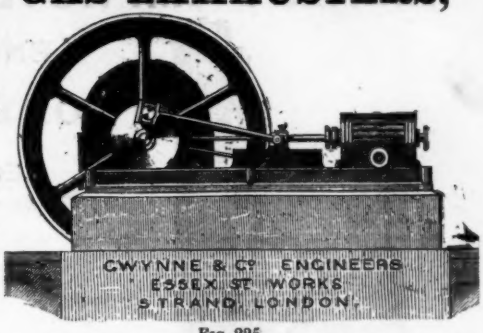

FIG. 225.

Fig. 224 represents one of those erected at the Imperial Gas-Works, Bromley, capable of passing 210,000 cubic feet of gas per hour. These Patent Machines combine the highest quality of workmanship and materials, the largest bearings and wearing surfaces, with the **most perfect system of action yet discovered.** Fig. 225 represents one of a series of four at the Nottingham Gas-Works, each passing 52,500 cubic feet per hour. GWYNNE AND Co. do not pretend to enter into a struggle with other makers in respect to **cheapness.** They have never sought to make **price the chief consideration,** but to produce Machinery of the very highest quality, and the most approved design and arrangement. Their prices have been estimated with a due regard to the **excellence of the article produced,** and when this is taken into consideration, they have no fear for the result.

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WITH TALC REFLECTORS AND SELF-ACTING VALVES

TO PREVENT DOWN-DRAUGHT;

VENTILATING GLOBE LIGHTS for DINING-ROOMS, LIBRARIES, &c.

Ormolu, Bronze, & Crystal Gaseliers;

MEDIÆVAL CHURCH WORK AND CORONÆ;

COCKS, VALVES, and FITTINGS for GAS, STEAM, and WATER;

COLUMNS, BRACKETS, & STREET LANTERNS;

BLACK AND GALVANIZED BARREL COMPO AND TIN PIPE.

GAS ENGINEERS,

100, HATTON GARDEN, LONDON.

Drawings and Prices upon application.

VICKARYS AND ROBERTSON,

Late JOHN VICKARY,

ESTABLISHED 1840,

GAS ENGINEERS, CONTRACTORS, IRON AND BRASS FOUNDERS,

WEST OF ENGLAND ENGINEERING WORKS, EXETER.

GASHOLDERS AND TANKS,

Retorts, Retort-Fittings, Condensers, Scrubbers, Purifiers, Station-Meters, Governors, Rack and Screw Valves. Gas and Water Mains always in Stock.

STEAM-ENGINES, EXHAUSTERS, SHAFTING AND GEARING, &c.

GAS-FITTINGS,

Including Chandeliers, Pendants, Hall Lamps, Brackets, Star and Sun Lights of all designs.

WET & DRY GAS-METERS,

Combining most recent improvements in principle and manufacture; upwards of 200,000 already in work, giving highest satisfaction.

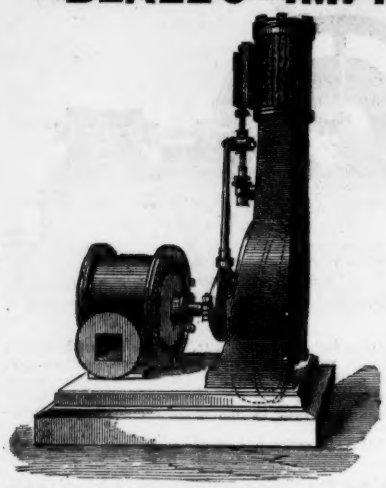
(A guarantee of five years given with every Meter.)

PLUMBERRS WORK, including Lift and Force Pumps; Cocks for Gas and Water and Steam; Brass Fittings.

HYDRAULIC AND GENERAL ENGINEERING.

LONDON OFFICE: 8, JOHN STREET, ADELPHI, W.C.

BEALE'S IMPROVED PATENT GAS-EXHAUSTER

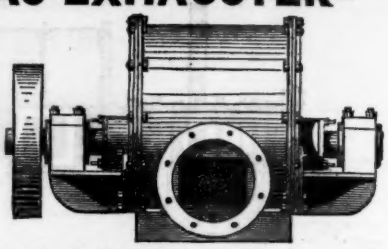


WITH

ENGINE COMBINED

ON

ONE BASE PLATE.



SOLE MAKERS,

GEORGE WALLER & CO.,

Who, since Mr. BEALE'S retirement, are the Oldest Makers.

EXHAUSTERS with HORIZONTAL ENGINE combined.
EXHAUSTERS with OUTSIDE BEARINGS.
MAKERS of ENGINES, BOILERS, and GAS MACHINERY.
TAR, LIQUOR, and SYPHON PUMPS. GAS-VALVES in stock, 2 to 30 inches.
SELF-ACTING BYE-PASS VALVES, with Lid and Relieving Lever.
MANN'S and many other descriptions of WATER DISTRIBUTORS,
SCRUBBERS, PURIFIERS, and CONDENSERS.
EXHAUSTERS from 3000 to 60,000, new and second hand, in stock.

PHŒNIX ENGINEERING WORKS, HOLLAND STREET, S.E., & at STROUD, GLOUCESTERSHIRE.

THE STEAM STOKER COMPANY, LIMITED,

ARE NOW PREPARED TO GRANT

LICENCES FOR THE USE OF THEIR VARIOUS PATENTS

FOR

STOKING BY MACHINERY.

UNDER one or the other of their Patents, Machines can be adapted to almost any existing works without material alteration of the Retort-Houses or Settings.

Applications, accompanied by full particulars as to dimensions of the Retort-Houses, Settings of the Retorts, &c., &c., should be addressed to the Secretary, at the Offices of the Company,

155, FENCHURCH STREET, LONDON, E.C.

WANTED, a NIGHT FOREMAN.
Address the MANAGER, Gas-Works, CAMBRIDGE.

WANTED, a situation as Gas-Fitter, Tinman, and Meter Repairer. Thirteen years good character from a Gas-Work.
Address W. P., care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Situation as leading STOKER. Understands engines and exhausters. Four years good references.
Address J. P., 87, Carlton Road, CAMDEN TOWN, N.W.

WANTED, in a small country Gas-Work, a steady, industrious man as WORKING FOREMAN. Good character indispensable. Wages 26s., with good house and garden on the works, coals, &c.
Address SECRETARY, Post-Office, MANSFIELD.

WANTED, by the Advertiser, a situation as MANAGER or FOREMAN of Gas-Works. Is well up in the making and distribution of gas in all its branches. First-class references.
Address D. H., Messrs. Chandler and Son, Gas Engineers, York Street, London Road, SOUTHWARK.

WANTED, by a thoroughly practical Man, having over 20 years experience, a situation as MANAGER in a Gas-Work where the annual make is from 6 to 20 millions, or SUPERINTENDENT in a large work.
Address B. Y., care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, immediately, for a small provincial Gas-Work, a competent person as SECRETARY and MANAGER.
Applications to be sent not later than the 25th inst., enclosing testimonials, and to state age and salary expected, to A. W., care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a situation as Manager of a Gas-Work, where the make is from 5 to 20 million cubic feet per annum, by a practical man, 31 years of age, of 14 years experience in the manufacture of gas, setting clay or iron retorts, main and service laying, meter fixing, &c. First-class testimonials both at home and abroad.
Address W. D., care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CARBONIZING FOREMAN.

WANTED, in a large provincial Gas-Work, a good CARBONIZING FOREMAN. To a thoroughly competent man, skilled in the management of men, and well up in carbonizing, liberal wages, with residence, &c., will be given.
Apply, stating particulars of present engagement, with references, to H. B., care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by the Staines and Egham Gas Company, Limited, an experienced FITTER. He must be a good main and service layer, able to undertake the smith's work, and the ordinary repairs of the works. None but a steady, industrious man need apply. Wages 24s. per week, with house, fuel, and gas.
Applicants to forward testimonials as to character and competency, addressed to the MANAGER, Gas-Works, EGHAM.
Gas Office, Egham, June 14, 1873.

WANTED, by a well-educated young Man, an appointment as DEPUTY-MANAGER or MANAGER of a small work. Has a thorough knowledge of the manufacture and distribution of gas, and the whole routine of a Gas-Work. A good draughtsman, and possesses a sound knowledge of French. Has no objection to go abroad. Unexceptionable references from present employer, with first-class testimonials.
Address YOUNG, care of W. H. Bennett, Esq., 42, Parliament Street, LONDON, S.W.

WANTED, by the Advertiser, an appointment as out-door Superintendent or Secretary and Manager of Gas-Works. Has been for the last 12 years with eminent Gas Engineers and Contractors at works where the annual make of gas is 80 million feet. Has also practical knowledge of the improved methods of gas testing for purity and illuminating power, &c., and can produce the highest references as to character, ability, and general business qualifications.
Address A., care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

"DON" ECONOMIC LUBRICATING OIL is about 40 per cent. cheaper than the kinds heretofore used by Gas Companies, many of whom have adopted it. The Alliance Gas Company say, "Your 'Don' Oil gives us every satisfaction." Trial casks sent on approbation.—DUNCAN BROTHERS, 2, Blomfield St., LONDON, E.C.

COOKING AND HEATING BY GAS,
BY
MAGNUS OHREN, A.I.C.E.
NEW AND REVISED EDITION.
Prepared for Gas Companies to circulate amongst their gas consumers.
£1 per 100; £3 15s. per 500; or £6 per 1000.
Address, MAGNUS OHREN, Gas-Works Lower Sydenham, London, S.E.

COST PRICE SHEETS.

MANUFACTURE AND DISTRIBU-TION OF GAS. These sheets are the same as were laid before the Dublin Meeting of the British Association of Gas Managers; but in the REPRINT, NOTES have been added for the guidance of those using them. Copies of the two sheets may now be had, price 5s.
South Shields, January, 1873. W. J. WARNER.

SITUATION WANTED, as Gas Stoker. Four years experience. Good references.
Address J. P., Gas-Works, Leatherhead, SURREY.

THE Advertiser desires an appointment with a Gas Company. Has had many years experience in the accountant's department, the last four years with one of the largest metropolitan gas companies.
Address W. L., care of Mr. Dodge, 9, Water Street, Blackfriars, LONDON, E.C.

TO RETORT SETTERS.

A Gas Company will shortly be in want of a RETORT SETTER, who will be required to set and repair all the retorts, and do the general bricklaying on the works. Constant employment will be found. None but thoroughly competent persons, or yet contractors, need apply.
Apply, by letter, to POSTULATA, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

PUPIL WANTED.

THE Advertiser is open to take a Youth about 16 or 17 years of age as an ARTICLED PUPIL. He would have good opportunities of acquiring a thorough knowledge of the management and erection of both Gas and Water Works.
For terms, &c., apply to T. A. DREW, Engineer and Manager, Gas and Water Works, WIDNES.

TO GAS COMPANIES.

A GENTLEMAN desirous of erecting and working Tar and Ammonia Works on a moderate scale would be glad to hear of a good centre for such a purpose.
Address L. R. E., care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO GAS ENGINEERS, MANAGERS, ACCOUNTANTS, AND OTHERS.

THE Advertiser, having had seven years practical experience in the manufacture and distribution of gas, and all matters connected therewith, including main-laying and gas-fittings, use of test apparatus, also office work and collecting, desires a RE-ENGAGEMENT in any suitable capacity. Unexceptionable testimonials.
Address R. Y. S., care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

A GENTLEMAN conversant with the Continental languages, and who has had very considerable experience in the superintendence and carrying out of Railways, Mines, Gas, Water-Works, &c., is open to an ENGAGEMENT for any part of the world, either on contract or superintendence. First-class references can be given, and security if required. He was formerly an associate of the R.I.C.E. of London, and similar connexion with foreign societies.
Address COSMO, Messrs. Deacon's Advertising Agency, Leadenhall Street, LONDON.

TO GAS COMPANIES.

WANTED, 816-in. Circular Mouthpieces (for 5 inch ascension-pipes) with lids and Box's patent fasteners; 2 furnace doors with dead plates, furnace and bearing bars and ash-pans; 4 corner and two middle buck stays and brace bars; 4 6-in. bends; 2 6-in. T's; 1 5-in. T; 4 5-in. bends, open corners for cleaning, fitted with stoppers and fasteners; 1 4-in. ditto: 8 4-in. straight pipes 3 feet long, fitted with stoppers and fasteners at one end; 1 reducing pipe from 6 to 5 in., with socket on the 6-in. end.
State lowest price to Mr. OWEN, Gas Company, LEDBURY.

FOR SALE—One 40 ft. by 16 ft. Gasholder at present in use, with 7-in. inlet and outlet pipes and hydraulic valves complete.
Can be seen working at the Radcliffe and Pilkington Gas-Works, near Manchester, or any information can be obtained respecting the same, by application to DAVID BRANDWOOD, the Company's Manager and Secretary.

FOR SALE, a Set of Four Second-hand PURIFIERS, 5 ft. square, 2 ft. 6 in. deep, with 5-in. connexions; four tiers wood sieves or grids to each, hydraulic centre-valve, lifting apparatus and girders, heavy castings, and fastened with ½-in. angle iron. Removed to place Purifiers of larger dimensions.
For price and particulars, apply to THOS. H. BOUTELL, Manager and Analyst, Gas-Works, SLEAFORD.

FOR SALE—A Station-Meter, with valves and connexions, passing 20,000 cubic feet per hour (maker Parkinson). Can be seen on application to Mr. R. Harris, Gas-Works, Bow Common, E.

Also one with valves and connexions, passing 40,000 cubic feet per hour (maker Parkinson). Can be seen on application to Mr. J. Johnson, 148, Goswell Road, E.C.

Proposals to be sent in to me on or before Thursday, the 26th inst. JOHN ORWELL PHILLIPS, Secretary.

Gaslight and Coke Company, Horseferry Road, Westminster, S.W., June 13, 1873.

MAIRIE DE BORDEAUX.

THE Mayor gives Notice that the Light-ing by gas of the city of Bordeaux will be DISPOSED OF by public auction on the 24th of July next.

The terms of the contract may be ascertained at the SECRETARY'S Office of the Mayoralty.

TO BE DISPOSED OF, in consequence of being replaced by larger ones, about 10 tons of OVAL FLANGED PIPES, 7 in. by 5 in., 6 ft. lengths, and equal to new.

For further particulars, apply to EDWARD PRICE, Engineer to the Hampton Court Gas Company, Works, HAMPTON WICK-ON-THAMES.

TO BE DISPOSED OF, in consequence of being replaced by larger ones, a pair of 6 H.P. VERTICAL ENGINES, with oscilating cylinders, and a pair of 20,000 feet per hour Rotary Exhausters, with all valves and connexions.

Also 28 15-in. D Mouthpieces and Ascension-Pipes to suit.

The above are in good condition, and will be sold together or separately.

Apply to W. C. WATSON, Engineer, Gas-Works, KINGSTON-ON-THAMES.

THE NEW GAS COMPANY, LIMITED.

THE Directors of the above Company are ready to receive APPLICATIONS from owners of existing Gas-Works, as well as from others erecting or about to erect new works, and to grant Licences for the use of the Patents.

Apply to the SECRETARY, 22, WALBROOK, E.C.

TO TAR DISTILLERS.

THE Directors of the Independent Gas-light and Coke Company are prepared to receive TENDERS for the TAR produced at their works, at Haggerston, for One year, from the 31st of July, 1873.

Tenders to be sent to me, on or before Thursday, the 3rd day of July, endorsed "Tender for Tar."

The Directors do not bind themselves to accept the highest or any tender.—By order,

JAMES B. COULSON, Secretary.

236, Kingsland Road, June 13, 1873.

TO TAR DISTILLERS, &c.

THE Directors of the Kingston-upon-Thames Gas Company are prepared to receive TENDERS for the surplus TAR produced at their works at Kingston, from July 1, 1873, to June 30, 1874. Quantity about 80,000 gallons. Tenders to be at per gallon f.o.b. the Contractor's barge.

Further particulars may be obtained from Mr. Watson, Manager, at the works.

Tenders to be sent to Mr. W. A. Fricker, Secretary, Gas Offices, Church Street, Kingston, on or before the 24th of June inst., endorsed "Tender for Tar."

The Company do not pledge themselves to accept the highest or any tender. By order,

W. A. FRICKER, Secretary.

Gas Offices, Kingston, June 2, 1873.

SALISBURY GASLIGHT AND COKE COMPANY.

PERSONS desirous of contracting for the purchase of the TAR made by the Salisbury Gaslight and Coke Company for Twelve months, from the 30th of June next, are requested to send TENDERS, addressed to Mr. Hardick, at the Gas-Works, Fisherton Anger, Salisbury, on or before the 16th of June.

For any further particulars application may be made to Mr. Hardick, at the works.

The Close, Salisbury, E. E. S. KELSEY, Secretary.

May 21, 1873.

MIDDLETON & TONGE IMPROVEMENT ACT, 1861.

THE Middleton and Tonge Improvement Commissioners are prepared to receive TENDERS for supplying the required FITTINGS for Eight Beds of Retorts —viz., wrought-iron hydraulic mains, together with the other necessary wrought and cast apparatus. A specification of the same may be seen on application to the Manager.

Tenders, addressed to the Chairman of the Gas Committee, to be delivered at my Office on or before Monday, the 30th instant, endorsed "Tender for Retort Fittings."

The Commissioners do not bind themselves to accept the lowest or any tender. By order,

JAMES WRIGLEY, Clerk to the Commissioners.

Commissioners Rooms, Gas Street, Tonge, Middleton, June 4, 1873.

THE BOMBAY GAS COMPANY, LIMITED.

THE Directors of this Company invite TENDERS for the purchase, in whole or in part, of a large quantity of surplus Brass and Iron GAS FITTINGS, consisting principally of

Union Cocks.
" with tinned ends.
" Elbows.
Caps and Linings.
Ceiling Plates.
Universal Joints (brass to join iron).
Bracket Backs for Brass.
Cone Joints. [backs.
Brass Nose Ends and Nose Pieces, with wing
Tinned-end Ground Unions.
Iron Pillar Cocks.
Iron Pendant Tops.
Brass Swivels, &c., &c., &c.

In accordance with a specification to be had at the Offices of the Company, where samples may be seen and lists obtained, any day between the hours of 11 and 4 o'clock.

Tenders to be endorsed "Tenders for Fittings," and addressed to the Secretary on or before Monday, July 7, 1873.

The Directors reserve the right of either accepting or rejecting the whole or any portion of any Tender.

WM. MARSHALL, Secretary.

4, Great Winchester Street Buildings, London, June 14, 1873.

TOWN OF DUDLEY GASLIGHT COMPANY.

CONTRACT FOR GAS COALS.

THE Directors of the above Company invite TENDERS for the supply of from 4000 to 8000 tons of Screened GAS COAL, as free from sulphur as possible, to be delivered in trucks, free, at Netherton Station, Great Western Railway, between July 1 next, and June 30, 1874.

Rates of delivery subject to arrangement.

Terms of payment monthly, in cash, less 2½ per cent. discount.

Tenders to be addressed to the Secretary, and endorsed "Tender for Gas Coal," on or before July 1 next.

The Directors do not bind themselves to accept the lowest or any tender.

Gas-Works, Dudley, June 11, 1873.

TENDERS FOR GAS COAL.

THE Walsall Improvement Commis-sioners invite TENDERS for the supply of 12,000 tons of STAVELEY, YORKSHIRE, or any other good GAS COAL, which may be delivered either at Walsall Railway Station, or by boat at Walsall Gas-Works; in the latter case it will also have to be unloaded and stacked in the coal-shed, or such other place at the Gas-Works as may be directed. The Coal will have to be delivered at the rate of from 150 to 400 tons per week as the Commissioners may from time to time require.

The weight, if delivered by rail, must be long weight; if by boat it must be 22 cwt. to the ton, boat gauge. Payments monthly.

The Commissioners do not bind themselves to accept any tender, and they reserve the right to divide the contract between several firms.

Tenders, sealed and marked outside "Tender for Gas Coal," and stating the price for large Coal and also for Nuts, are to be sent to the undersigned on or before Saturday, June 21. SAMUEL WILKINSON, Commissioners Clerk.

Bridge Street, Walsall, June 4, 1873.

REMOVAL.

J. B. M'GUIRE, Contractor, Stabrock HOUSE, BOLTON-LE-SANDS, near LANCASTER.

REMOVAL.

MR. ALFRED PENNY, C.E., begs to give notice that he has REMOVED his Offices from the Wenlock Iron-Works to No. 20, ABINGDON STREET, WESTMINSTER, where he may be consulted as usual on all matters connected with Gas-Works, Water-Works, and Drainage, both for England and Abroad.

Demy 16mo., Sixty-four pages,

ADVANTAGES of GAS. By J. O. N. RUTTER. A new edition.—201st Thousand. Brighton: Published by the Author.

This little book is intended for distribution by Gas Companies and the manufacturers of gas apparatus. It has done good in making known the benefits and promoting the sale of gas; and it is hoped that its usefulness might be continued and greatly extended.

Prices:—1000 copies, £8; 500 copies, £4 5s.; 250 copies, £2 5s. Any smaller number at 20s. per 100 copies.

A specimen copy free per post for three penny stamps. Covers printed specially.

Apply to J. O. N. RUTTER, Black Rock, BRIGHTON.

Nov. 13, 1871.

THE PATENT RIBBED GAS RETORTS are strongly recommended for their efficiency and great durability. They are in use at above 150 Gas-Works.

Illustrated circular, testimonials, and prices, will be forwarded on application to

A. C. FRASER,

PATENT GAS COMPANY, GAS-WORKS, NEW BARNET, HERTS.

OXIDE OF IRON.—

We are prepared to supply, on moderate terms

HYDRATED PEROXIDE OF IRON (BOG OCHRE),

Same quality as supplied by us to several of the most extensive Gas Companies, and which has given entire satisfaction.

FRANCIS RITCHIE & SONS,
BELFAST.

CAST-IRON SOCKET-PIPES FOR WATER OR GAS.

THOMAS ALLAN AND SONS, SPRINGBANK IRON-WORKS, GLASGOW,

Have FOR SALE at their branch works, South Stockton-on-Tees, the following PIPES of superior quality, all proved to 300 feet:—

Size.	Length.	Weight per Pipe. Cwt. qr. lb.	Quantity.
1¼ in. ..	6 ft. ..	0 1 2 ..	1000 pipes.
2 " ..	6 " ..	0 1 14 ..	2000 "
3 " ..	9 " ..	0 3 14 ..	4500 "
3 " ..	9 " ..	0 3 21 ..	550 "
4 " ..	9 " ..	1 1 14 ..	3500 "
5 " ..	9 " ..	1 3 14 ..	300 "
6 " ..	9 " ..	2 1 14 ..	100 "

For terms address THOMAS ALLAN AND SONS, GLASGOW.

June 9, 1873.

TORBANEHILL MINERAL.

For Sale, by Tender,

FOR WHOLE OR PART,

SEVERAL THOUSAND TONS OF THE

Celebrated Torbanehill Mineral,

Saved from the fire at Torbanehill in June last.

The mineral as it at present lies has been examined and analyzed by Dr. WILLIAM WALLACE, Analytical Chemist, Glasgow, who says:

"Very great care was employed to obtain reliable average samples, and the results show that the mineral is not appreciably damaged."

The results of two testings of fair samples of the Coal give 14,080 cubic feet of 43·7 candle gas.

APPLY TO

MR. DAVID STEWART,
128, INGRAM STREET, GLASGOW.

ALFORD GAS COMPANY,

LIMITED.

Incorporated under the Companies Acts, 1862 and 1867, whereby the Liability of the Shareholders is strictly limited to the amount of their Shares.

CAPITAL, £10,000, IN 2000 SHARES OF £5 EACH.

First Issue, £5000, in 1000 Shares of £5 each.

Deposit on Application, 10s. per Share, and 20s. on Allotment.

Subsequent Calls not to exceed 20s. per Share per Month.

Applicants have the option of paying the full amount of their Shares on Application at a discount of 5 per cent.

Directors.

JOHN W. CASEY, Esq., Gentleman, Willoughby House, and Alford, *Chairman.*
Alderman W. SIMPSON, Esq., Chairman of the Rochdale Corporation Gas Committee.
Councillor C. PRESTON, Esq., Rochdale Gas Committee.
Councillor E. KAY, Esq., Barnsley Corporation.
G. W. CROSLAND, Esq., Iron Merchant, Huddersfield.
J. BURGESS, Esq., C.E., Engineer and Manager of the Huddersfield Corporation Gas-Works.
Mr. W. BROWN (late of the City of London Gas Company), Eagle Hotel, Mablethorpe, Alford.
Mr. H. BONTOFT, Bookseller and Stationer, Market Square, Alford.
Mr. J. H. WHITTON, Windmill Hotel, Alford.

Bankers.

MIDLAND BANKING COMPANY, LIMITED, Huddersfield, and Branches.
LINCOLN AND LINDSEY BANKING COMPANY, Alford, and Branches.

Engineer.

S. HUNTER, Esq., C.E., Engineer to the Rochdale Corporation Gas-Works.

Brokers.

Messrs. W. MOORE and SON, Huddersfield.

Secretary (*pro tem.*)—Mr. H. BONTOFT, Alford.

This Company has been formed for the purchase of the Gas-Works now supplying the town of Alford with gas, consisting of retort-house, coal store, purifying-shed, governor and meter-house, fittings shop, manager's house, retorts, condensers, purifiers, gasholders and tanks, tar and water wells, with all the machinery and fittings thereto belonging. The whole of the above works are situated on freehold land, enclosed in with good boundary wall and entrance gates. Also the freehold land, with two cottages and warehouse adjoining the works, and now let to tenants; also the cast-iron main-pipes, valves, service-pipes, lamp-posts, and consumers meters, now in use for the public and private lighting of the town.

Alford is the centre of a large district, being the largest town between Boston and Louth, on the East Lincolnshire Railway, and is one of the most increasing places on the east coast of Lincolnshire.

The works were in the hands of two private gentlemen, but in consequence of the death of one, and the other living a distance from Alford and being wishful to retire, arrangements were made by which this undertaking can be formed into a limited liability company, and thus giving the consumers the opportunity of having an interest therein.

The nominal capital of the Company is greater than at present required, but as alterations and extensions must be made, the amount of the capital was determined so as to pay for such future wants without the additional cost of re-registration.

Investors have the satisfaction of knowing that there is no working on probabilities, the works being already established.

The Engineer has gone fully into the working of the concern for several years past, having examined the books and plant, and his report, which may be seen at the Offices of the Company, states that not less than 6 per cent. dividend may be confidently relied upon.

The Vendor agrees to sell the works in accordance with this report of the Engineer, thereby ensuring to the investors that the minimum dividend shall not be less than 6 per cent., with a *prospect of an increase, and a proportionate rise in the value of the shares.*

Neighbouring gas companies pay large dividends, and their shares are at a premium of 80 per cent. and upwards.

The Vendor is willing to take one-half of the purchase sum in fully paid-up shares of the Company.

The Company are authorized by their Articles of Association to adopt any new method of making gas so soon as the same shall be proved to be commercially profitable.

Prospectus, with forms of application, to be had from the Bankers, Brokers, and Secretary.

One-half the required capital has already been taken by private subscription.

Application for shares, accompanied by deposit, to be made on the annexed form, and sent to the Bankers or Brokers.

FORM OF APPLICATION FOR SHARES.

To the Directors of the "Alford Gas Company, Limited."

Gentlemen,—Having paid £ to your Bankers, I request you to allot me Shares of £5 each in the "Alford Gas Company, Limited;" and I hereby agree to accept the same, or any less number that may be allotted me, and to pay the calls thereon, and I authorize you to insert my name in the register of the members of the Company.

Name (in full).....
Address .....
Profession or business .....
Date.....

The above form, when filled up, is to be left with the Bankers or Brokers on payment of the deposit.

RECEIPT.

Received from the Sum of £ , being the deposit of 10s. per Share on an application for Shares in the "Alford Gas Company, Limited."

£ : :

Mr. ALFRED LASS,

60, CORNHILL, LONDON, E.C.,

Is prepared to open the Books, and, if necessary, keep the Accounts of Gas and Water Companies.

To examine the Books and Accounts, and prepare Balance-Sheets for the information of Directors.

To assist Secretaries in preparing Balance-Sheets, according to the "Gas-Works Clauses Act, 1871;" or may be consulted with respect to Accounts generally.

SAMUEL PONTIFEX, Consulting Gas Engineer, having retired from the Great Central Gas Company, is now prepared to furnish PLANS and SPECIFICATIONS, as well as ADVISE Provincial Gas Companies as to the erection of new, or alteration and enlargement of existing works.

Offices: 22, Coleman Street, LONDON, E.C.

J. T. B. PORTER & A. SILVERTHORNE, C.E., 1, Westminster Chambers, LONDON, S.W., Consulting Engineers.

Corporations and Companies advised on all matters connected with Gas and Water Works.

CLAYTON'S PATENT SIX-WAY VALVE only requires one valve to work two purifiers; saves more than three-fourths of the connexion-pipes; requires neither tees, elbows, nor bends; no racks or springs to get out of order.

For particulars, apply to CLAYTON, SON, & Co., Gas Engineers, Hunslet, LEEDS.

BIRTLEY IRON WORKS,
CHESTER-LE-STREET,
DURHAM.

Manufactory for every description of Casting and Machinery for Gas-Works and Water-Works.

Warehouse in London for Cast-Iron Pipes and Connexions of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.

Agent in London, Mr. J. MANWARING, 101 Cannon Street E.C.

WILLIAM BRODIE & CO.,

GAS ENGINEERS,

MANUFACTURERS AND CONTRACTORS FOR

GAS APPARATUS, GASHOLDERS, TANKS, VALVES, IRON ROOFS, GIRDERS, BRIDGES, &c.,

CALEDONIA IRON-WORKS, PAISLEY.

Attention is requested to

BRODIE'S IMPROVED GAS APPARATUS,

Admitted to be the best and most economical for lighting factories, railway stations, mansions, country houses, and other isolated buildings.

FIRE-CLAY RETORTS.

WILLIAM FRASER,

INVERKEITHING,

(Owner of the Works at which Fire-Clay Retorts were first made), can supply

RETORTS, FIRE-BRICKS, &c.,

to any extent.

References can be given to managers of above a hundred Gas-Works whom he supplies.

He ships at Charlestown his

CELEBRATED HALBEATH STEAM COALS,

on Navy List.

ALEXANDER F. PAINTER,

CONTRACTING ENGINEER

FOR

GAS & WATER WORKS,

GREAT BERKHAMPSTEAD, HERTS.

Foreign Orders carefully executed. Provincial Gas-Works designed and erected. Extensions of Works carried out with despatch. Mains supplied and promptly laid. Public and Private Buildings fitted up. Gasholders, Purifier Covers, and all Sheet Ironwork. Wrought Ironwork to drawing.

Specifications, Estimates, and Tenders given.

GAS-WORKS LEASED.

EDGE'S PATENT

FOR REMOVING THE

CARBONACEOUS INCRUSTATION FROM GAS-RETORTS.

"*Gas-Works, Bury St. Edmund's, Oct.* 24, 1870.

"Dear Sir,—In answer to your inquiry about Edge's patent method of scurfing Retorts, I beg to inform you that I can give it my unqualified recommendation.

"Some years ago, in order to facilitate the scurfing process, I introduced open-ended Retorts here, and found them a great improvement upon the common Retorts, which, in addition to the damage they received at scurfing times, were very leaky for several days afterwards. Even with that plan there was a considerable amount of labour and care, which I have avoided since the adoption of Edge's method.

"I find the amount paid for royalty less than the entire cost of open-ended Retorts; and in addition, that less labour is required and less damage is done to the Retort in scurfing.

"As Edge's method does not burn the carbon out of the cracks so much as most other plans, and my stokers are pleased with it, I regard it as invaluable in reducing one of the anxieties of the gas manufacturer.

"Having a steam-engine on the premises, it was easy of adoption here, but my opinion of it is so high that I would recommend all gas managers who are not so situated, to provide themselves with a portable steam-boiler, and am sure that they will never regret the investment.—I am, dear sir, yours truly,

"E. Goddard, Esq." "THOS. H. METHVEN.

For particulars and terms, apply to E. GODDARD, Sole Agent, Gas-Works, IPSWICH.

J. & J. BRADDOCK,

GAS ENGINEERS,

GLOBE METER-WORKS, OLDHAM,

MANUFACTURERS OF

IMPROVED CONSUMERS GAS-METERS,

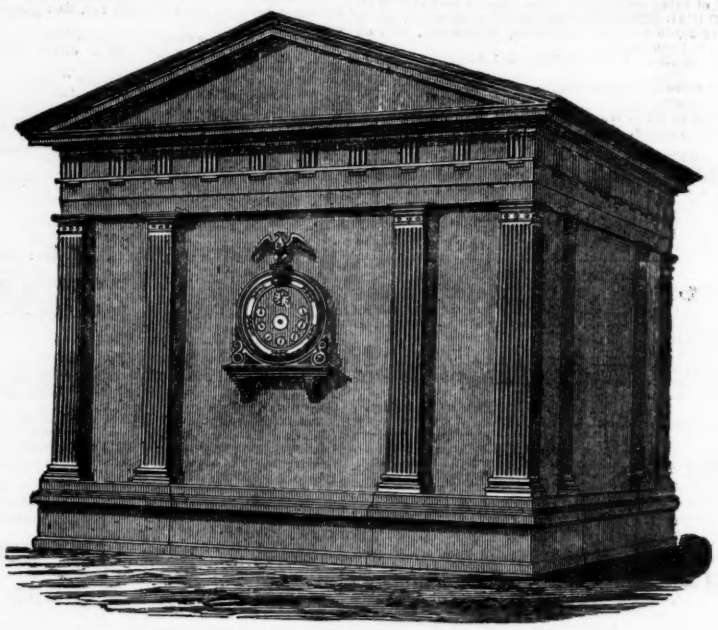
Of the best material and workmanship, carefully adjusted to the requirements of the British Sales of Gas Act and Foreign Standards of Measures.

PATENT FIXED WATER-LINE GAS-METERS,

Which are uniform with the ordinary Meters, and register with minute accuracy.

IMPROVED DRY GAS-METERS,

IN BEST TINNED IRON CASES.



GAS STATION-METERS,

WITH PLANED JOINTS.

GOVERNORS, GAUGES, INDICATORS, EXHAUST-GOVERNORS, &c.

Home and Foreign Orders promptly attended to.

All Sizes of CONSUMERS METERS, STATION-METERS, and GOVERNORS generally in Stock.

Orders almost invariably despatched on the day of receipt.

TERMS, &c., ON APPLICATION.

TO GAS COMPANIES, ENGINEERS, CONTRACTORS, AND OTHERS.

GEORGE NEWTON,

UNION STREET WEST, OLDHAM,

BRASS FOUNDER AND FINISHER,

MANUFACTURER OF

IMPROVED WET AND DRY CONSUMERS GAS-METERS,

LAMP METERS AND BOXES,

GOVERNORS, GAUGES, INDICATORS, EXHAUST & PRESSURE REGISTERS,

GAS STATION-METERS,

With all the joints planed.

TERMS, &c., ON APPLICATION.

ALFRED WILLIAMS,

PHŒNIX FIRE-BRICK WHARF,

64, BANKSIDE, SOUTHWARK, LONDON, S.E.

GAS ENGINEER AND CONTRACTOR FOR THE ERECTION OF GAS-WORKS,

AND FOR THE

SUPPLY OF RETORTS, FIRE-BRICKS, CAST-IRON MAINS,

AND ALL MATERIALS FOR GAS MANUFACTURE AND DISTRIBUTION.

JAMES MILNE & SON,

GAS ENGINEERS,

Gas-Meter, Gas Apparatus, and Gas-Fittings Manufacturers,

EDINBURGH, AND

2, KING EDWARD STREET,

NEWGATE STREET, LONDON.

STATION-METERS, GOVERNORS, CONSUMERS METERS, GAS LUSTRES, CHANDELIERS, BRACKETS, &c.,

And every description of Gas-Fittings and Gas Apparatus.

SCHOLL'S

PATENT PLATINUM

GASLIGHT PERFECTER.

Extract from Report by Dr. Letheby:—

"The results have been very remarkable, for they show an average increase of 63 per cent. on the illuminating power of the gas. I am of opinion, therefore, that the invention is of great practical value."

Extract from Dr. Frankland's Course of Lectures at the Royal School of Mines, February, 1868.

"Scholl's Platinum Perfecter is one of the most important inventions of modern times in connexion with the burning of coal gas."

Price 1s. each for Fishtail Burners.

To be had retail of Gas-Fitters and Ironmongers.

JOHN SCHOLL, Manufactory: 41 & 42, BERWICK STREET;

Retail Depot: 198a, OXFORD STREET, LONDON, W.

Terms on application. N.B.—A specimen sent free on receipt of Twelve stamps.

*** Farther testimonials from Drs. Frankland and Crooks, showing the great practical value of this invention, will be shortly published.

CANNEL COAL.

ELLIS LEVER & CO.,

GAS COAL MERCHANTS,

107, PICCADILLY, MANCHESTER.

ALL CLASSES OF

ENGLISH, SCOTCH, & WELSH CANNEL COALS.

SAM. CUTLER & SONS,

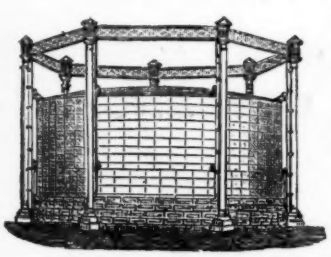
CONTRACTING GAS ENGINEERS,

GASHOLDER & GENERAL GAS APPARATUS MAKERS,

MANUFACTURERS OF

BOILERS, IRON ROOFING, IRON BRIDGES,

AND GENERAL IRONWORK.



S. C. AND SONS undertake Contracts of any magnitude for the **Erection of new and Remodelling of existing Gas-Works**, for **Gasholders, Cast and Wrought Iron Tanks, Iron Roofs**, and every description of **Apparatus** for the Manufacture and Distribution of Gas.

Special attention is invited to their **"Improved Condenser,"** which is very effective, and much approved; also to their patterns of **Annular** and other **Condensers, Scrubbers**, and **Purifiers**, of all sizes, which they arrange either with **Centre** or Ordinary **Slide Valves.**

WORKS FOR THE SUPPLY OF

VILLAGES, MANSIONS, FACTORIES, &c.

S. C. AND SONS undertake the **Supply** and **Laying** of **Mains** for **Gas and Water**, and supply all Castings, Connexions, and Fittings for Retort-House, Works generally, and for Streets. They also supply **Valves** of all descriptions, Iron and Clay Retorts, Hotpressed Retort-Lids, Steel Charging-Scoops of improved make, for which they have special machinery, Improved Coke and Coal Barrows, Cross-Bars and Screws, Bolts and Nuts, Furnace and Stoking Tools, Iron and Wood Purifier-Sieves, Lead, Yarn, Borings, &c., including every requisite whatsoever for a Gas-Work, a well-assorted stock being kept of those goods most in request.

SOLE MAKERS OF BRETT'S PATENT COKE BARROW.

Experienced Retort Setters sent to any part of the Kingdom.

Address: **PROVIDENCE IRON-WORKS, MILLWALL, LONDON.**

B. CARPENTER'S

IMPROVED WOOD SIEVES

FOR

GAS PURIFIERS & SCRUBBERS.

WORKS:

22, HERMES STREET, PENTONVILLE ROAD,

LONDON, N.

The above Sieves are used by all the Gas Companies in London and a great many in the country. Their utility, durability, and cheapness combined, render them superior to all others.

Testimonials from Gas Engineers who have tested their qualities forwarded on application.

All orders punctually attended to, and estimates given if required.

INTERNATIONAL EXHIBITION, 1862.

CLASS X.

PRIZE MEDAL

For excellence of Fire-Clay Gas Retorts, and "HONOURABLE MENTION" for good quality of Fire-Bricks.

WILLIAM STEPHENSON & SONS,

THROCKLEY,

NEWCASTLE-ON-TYNE.

THOMAS EDINGTON & SONS,

PHŒNIX IRON-WORKS,

GLASGOW,

MANUFACTURERS OF

GAS AND WATER PIPES,

All sizes up to 4 ft. diameter;

RAILWAY CHAIRS AND SLEEPERS, and general Castings. Also

GREGORY'S & COCKBURN-MUIR'S

PERMANENT WAY.

London Office: 63, OLD BROAD STREET, E.C.

J. T. B. PORTER & CO.,

GAS ENGINEERS,

MANUFACTURERS AND CONTRACTORS FOR GAS-WORKS

Of any extent at Home and Abroad,

GOWTS BRIDGE WORKS, LINCOLN,

AND

1, WESTMINSTER CHAMBERS, VICTORIA STREET, S.W.

BRONNER'S PATENT GAS-BURNERS give 99 per cent. of light, as compared with 27 per cent. given by ordinary burners, with equal consumption of gas.—*Vide* "Gas Referees Report," published June, 1869.

HENRY GREENE AND SON, Sole Consignees of Brönner's Patent Improvements in Gas Lighting, 16 and 17, King William Street, LONDON, E.C.

BELGIAN CLAY RETORTS.

J. SUGG and CO., late ALBERT KELLER, GHENT.—The removal of the import duties on Earthenware permitting the entry of Clay Retorts into England, Messrs. Sugg, of Ghent, beg to draw the attention of the Gas Companies of London, and other Cities, to the very superior quality of the RETORTS manufactured by them. They can be made of any size, in one piece, and of any form. The price will be in proportion to the weight, and very moderate in comparison to their value.

Communications addressed to J. SUGG & CO., GHENT, will receive immediate attention.

CATHELS & TERRACE'S Patent Four-WAY DISC GAS-VALVE is the simplest and best Valve for Purifiers, and as a By-pass for other apparatus in Gas-Works. It is always gas-tight, and has no springs, ground faces, or other delicate parts. By its use the flow of the gas cannot be accidentally stopped, and it never sticks.

For prices, &c., apply to the Manufacturers, Messrs. GUEST AND CHRIMES, Foundry and Brass Works, ROTHERHAM.

CATHELS'S Patent District Dry Gas-GOVERNOR is the only perfect self-acting contrivance for Regulating the Pressures in the higher levels of a district.

For prices, &c., apply to the Manufacturers, Messrs. GUEST AND CHRIMES, ROTHERHAM.

ADDISON POTTER,

WILLINGTON QUAY,

NEAR NEWCASTLE-UPON-TYNE,

Manufacturer of Clay Retorts, Fire-Bricks and every description of Fire-Clay Goods.

TO GAS COMPANIES, ENGINEERS, &c.

WOOD SIEVES.—WOOD SIEVES.

Estimates given and Contracts taken by the Manufacturer

GEORGE MACKANESS,

36, EDWARD STREET, HAMPSTEAD ROAD,

LONDON, N.W.

These Sieves are made with parallel or bevel bar, and guaranteed to be well seasoned yellow deal, and not common spruce so generally used.

N.B.—Specimens sent free on application.

JAMES OAKES & CO.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

WENLOCK IRON WHARF, 20 & 22, WHARF ROAD, CITY ROAD, LONDON, N.,

Beg to inform Gas and Water Companies and the public, that they keep in stock in London all the CASTINGS in general use in Gas and Water Works, including Iron Retorts, Socket and Flange Pipes, Bends, Branches, and Syphons of all sizes, Lamp Columns, &c., &c.

N.B.—Orders for Cast-Iron Tanks, Girders, Columns, Cylinders, and all irregular castings, will have immediate attention. CHARLES HORSLEY, Agent.

THE IMPERIAL METER COMPANY, LIMITED,

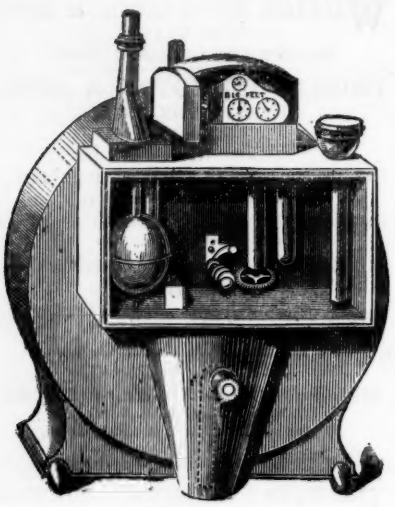
MANUFACTURERS OF

WET AND DRY GAS-METERS,

PRESSURE-GAUGES AND GOVERNORS, AND STREET-LAMP REGULATORS.

FACTORIES:

KING'S ROAD, LONDON, N.W., and GRAY'S INN ROAD, LONDON, W.C.



Front View.

THE

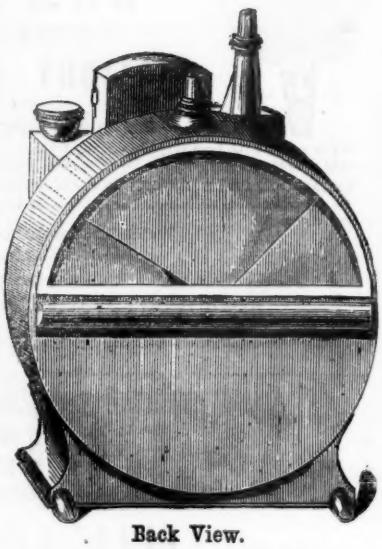
IMPERIAL

COMPENSATING

WET GAS-METER.

DE CASTRO & BURTON'S

PATENT.



Back View.

I. **This Meter is more simple in construction than the common non-compensating Meter.**
II. **An unvarying water-line is maintained.**
III. **No amount or kind of pressure will cause it to "flood."**
IV. **It is practically unaffected by "tilting."**
V. **The friction is less than in any other Meter; and**
VI. **It will last for twelve months without requiring to be refilled.**

THE IMPERIAL METER COMPANY, LIMITED, ALSO MANUFACTURE COMMON NON-COMPENSATING WET GAS-METERS OF ALL SIZES, BOTH IN TIN AND CAST-IRON CASES.

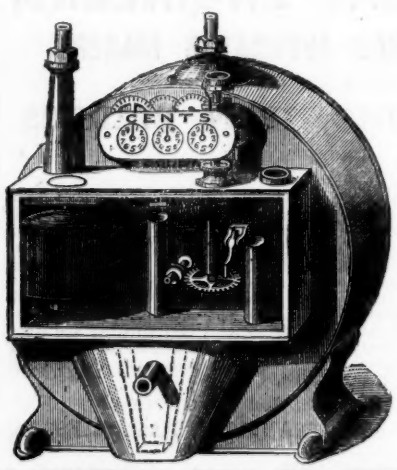
THE COMPENSATING

WET GAS-METER

IS UPHELD FOR

TEN YEARS

WITHOUT CHARGE.



THE IMPERIAL WET GAS-METER.
Non-Compensator.

STATION-METERS

WITH PLANED JOINTS,

AND

GOVERNORS,

MADE TO ORDER.

Mr. GEORGE MACKANESS will represent this Company in the Provinces.

OFFICES: 41, FLEET STREET, LONDON, E.C.

W. MOORE, Secretary.

☞ *All Communications to be addressed to the Secretary.*

THE IMPERIAL METER COMPANY, LIMITED,

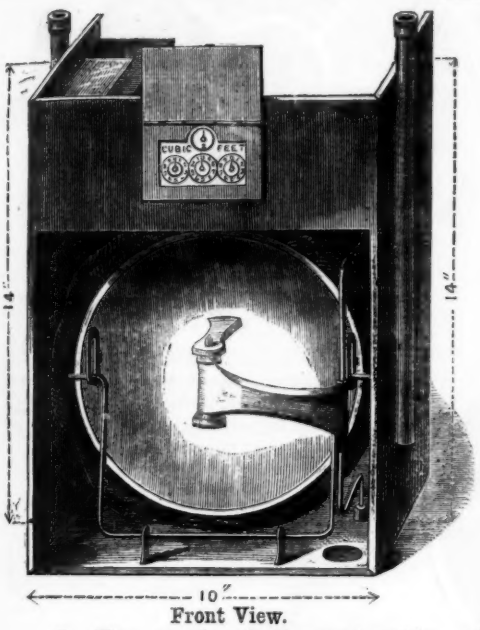
MANUFACTURERS OF

WET AND DRY GAS-METERS,

PRESSURE-GAUGES AND GOVERNORS, AND STREET-LAMP REGULATORS.

FACTORIES:

KING'S ROAD, LONDON, N.W., and GRAY'S INN ROAD, LONDON, W.C.



Front View.

THE

IMPERIAL

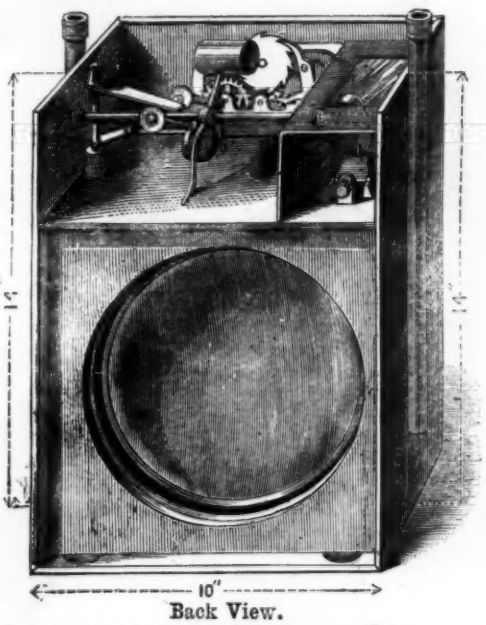
DRY

GAS-METER

SINGLE DIAPHRAGM.

TELLING & JOHNSON'S

PATENT.



Back View.

I. **The mechanical construction of this Meter is simpler and stronger than any other.**
II. **About half as much leather is used as in ordinary dry Meters.**
III. **The Meter has only one valve, and this cannot "stick."**
IV. **The lights maintain perfect steadiness and strength of flame. There is no "draw."**
V. **The gas consumed can only be measured from the inlet to the outlet, and**
VI. **The index cannot be made to register backwards.**

THE IMPERIAL METER COMPANY, LIMITED, ALSO MANUFACTURE ORDINARY DOUBLE DIAPHRAGM DRY GAS-METERS OF ALL SIZES, BOTH IN TIN AND IN CAST-IRON CASES.

SPECIAL ATTENTION

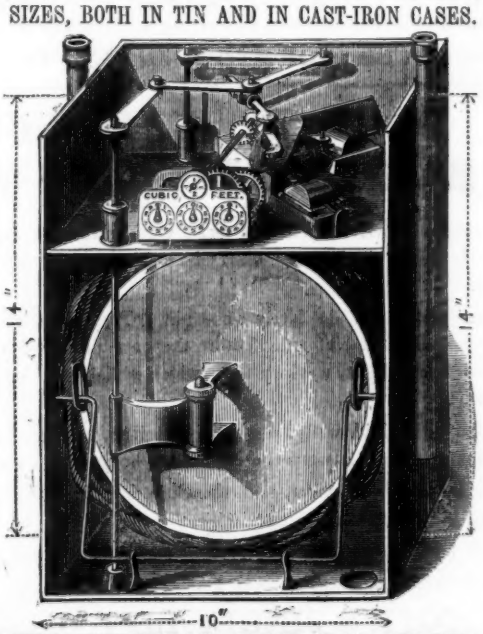
IS PAID TO THE

MANUFACTURE OF

STREET-LAMPS

AND

REGULATORS.



THE IMPERIAL DRY GAS-METER.
Double Diaphragm.

EVERY

DRY GAS-METER

IS UPHELD FOR

SIX YEARS

WITHOUT CHARGE.

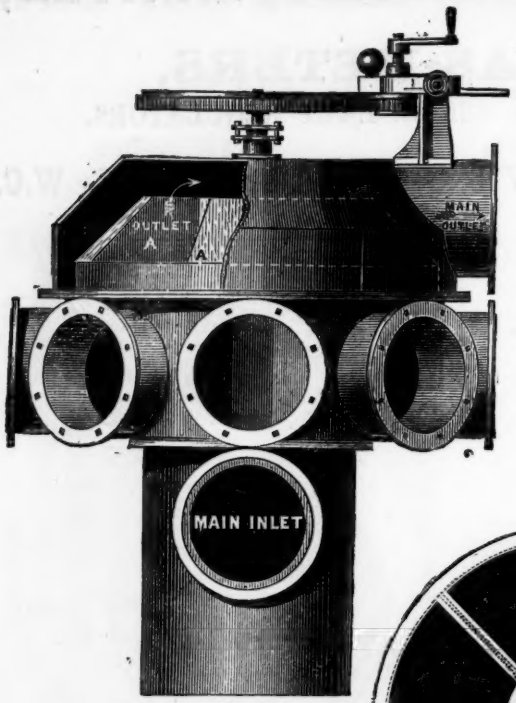
Mr. GEORGE MACKANESS will represent this Company in the Provinces.

OFFICES: 41, FLEET STREET, LONDON, E.C.

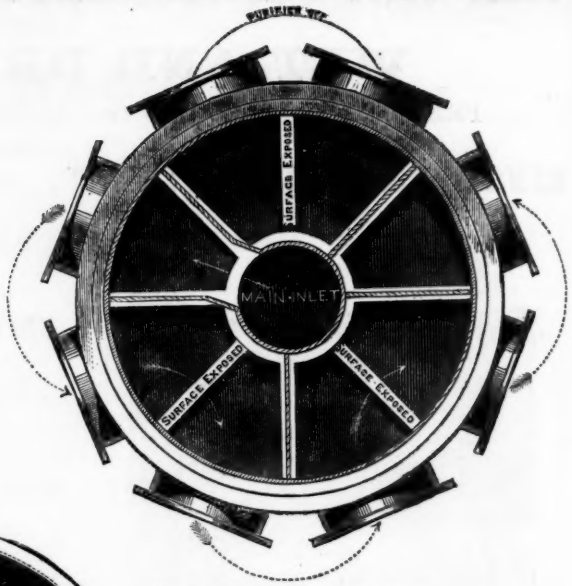
W. MOORE, Secretary.

☞ *All Communications to be addressed to the Secretary.*

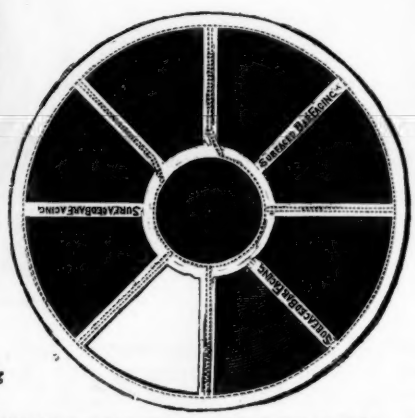
C. & W. WALKERS' PATENT CENTRE-VALVES.



Elevation of the Centre-Valve for four Purifiers. The safety cover is shown broken, to enable the Valve itself, which is inside, to be seen.



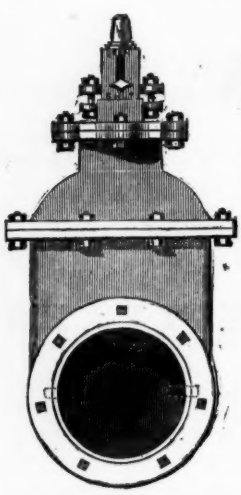
Plan of the Body, showing the Valve lying in it, with three of the facings, which were formerly exposed to settlements of dirt, carbon, naphthaline, &c., but which are now always covered by the surfaced bar-facings of the Valve. (See below.)



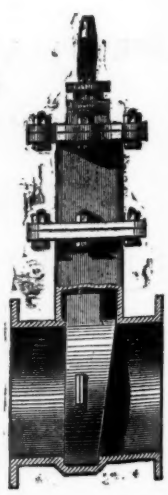
Plan of the Valve, or upper portion, showing the surfaced bar-facings referred to above.

These PATENT CENTRE-VALVES are the most perfect and certain means for working Purifiers. The Valve itself is protected from all injury inside the safety cover. The working of the Valve is so easy, and so governed by the stop-catch movement, that the Purifiers can be instantaneously changed in the dark as well as in daylight. They are scraped perfectly true, metal to metal, the facings heretofore exposed are always covered, and there is nothing more reliable, certain, and durable in a gas-works. By their use the floor of the Purifying-house is clear and level; the Valve and all connexions being beneath the floor, out of the way of working. A very considerable improvement and saving is effected in the cost of the connecting-pipes.

FOUR-WAY CENTRE-VALVES FORMING INLET, OUTLET, AND BYE-PASS.



C. & W. WALKERS'
DOUBLE-FACED GAS-VALVES.



These solidly constructed double-faced Gas-Valves are superseding the old system of the light, single-faced disc, which is too uncertain and unreliable in large bores.

They are guaranteed absolutely gas-tight. They are very massive and rigid, and by improved modes of manufacture they are produced at very little excess in cost over the old light, weak system, which is liable to spring and bend, and become leaky.

The Valve is a rigid wedge of solid cast iron, having two perfectly scraped surfaced facings fitting between the two on the body, which are also surfaced.

A spring in two short halves, and, therefore, not liable to break, is used only for scraping the front facing clean.

The front facing is vertical; the back facing forms the wedge.

At a slight additional expense both flanges are faced to bolt to main-pipes.

GASHOLDERS, TELESCOPE & SINGLE-LIFT, of LARGEST DIMENSIONS.

PURIFIERS, SCRUBBERS, CONDENSERS of most Improved Description.

WOOD SIEVES FOR PURIFIERS,

Which have now been in use for more than ten years, and their advantages and durability fully established. They are made entirely by steam machinery in very large quantities at the most moderate cost.

MIDLAND IRON-WORKS, DONNINGTON, near NEWPORT, SHROPSHIRE; 8, FINSBURY CIRCUS, LONDON.

COLLIERY OFFICE, STOURBRIDGE.

SCARCITY OF COALS!!!

G. J. EVESON has on offer large quantities of CANNEL COAL and ordinary GAS COAL for immediate delivery to any part of England. Rates and prices on application.

G. J. EVESON,

COLLIERY OFFICE, STOURBRIDGE.

GAS COKES TAKEN IN ANY QUANTITY IN RETURN WAGGONS, OR WAGGONS SPECIALLY SENT.

THE THAMES BANK IRON COMPANY,

(Successors to LYNCH WHITE,)

SUPPLY FROM STOCK

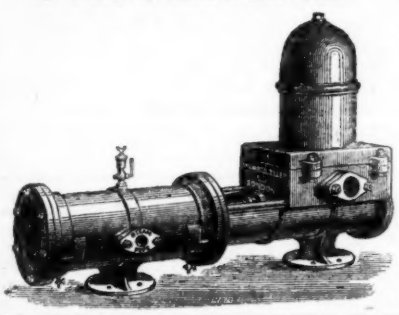
CAST-IRON RETORTS, SOCKET-PIPES for GAS or WATER PURPOSES, FLANGE-PIPES for STEAM, RAIN-WATER PIPES and GUTTERS, HOT-WATER PIPES and BOILERS, and all requisite Connexions for same; also LAMP-COLUMNS, LAMPS, WROUGHT FRAMES, WROUGHT-IRON TUBING, &c., &c.

All kinds of Gas-Works Apparatus and General Castings made to Pattern or Drawing.

ADDRESS—

OLD BARGE WHARF, UPPER GROUND STREET, LONDON, S.E.

THE PATENT
"UNIVERSAL" STEAM PUMP.



SOLE MAKERS,

HAYWARD, TYLER, & CO.,

84 & 85, UPPER WHITECROSS STREET, LONDON, E.C.

IN USE IN SOME OF

THE PRINCIPAL GAS-WORKS IN LONDON, SHEFFIELD, PENISTONE, &c.,

FOR

TAR AND AMMONIACAL LIQUORS.

Ardwick Bridge Chemical Works, Manchester, Oct. 28, 1872.

Sir,—The "Universal" Steam Pump obtained from you, and which has been employed during the last six months pumping caustic soda at these works, still continues working satisfactorily.—Yours truly,

(Signed) PETER HART, *Manager.*

HENRY SKOINES,

CONTRACTING GAS ENGINEER

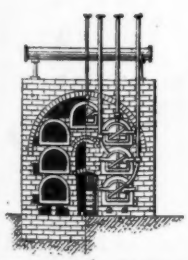
FOR

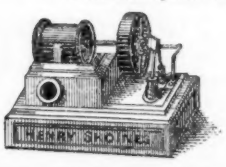
SETTING RETORTS,

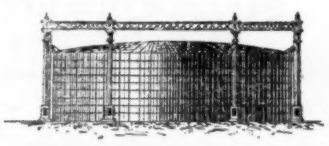
ERECTING AND REMODELLING GAS-WORKS

OF ANY EXTENT, AT HOME AND ABROAD.

RETORTS RESET, and the whole or any portion of Gas Apparatus supplied to the Trade, with their choice of name and device, if desired.







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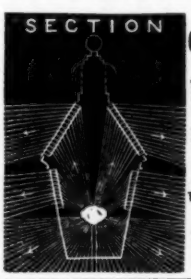

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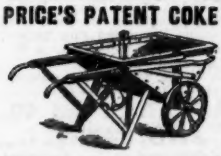

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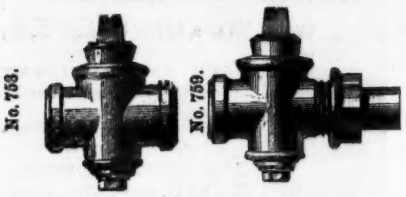

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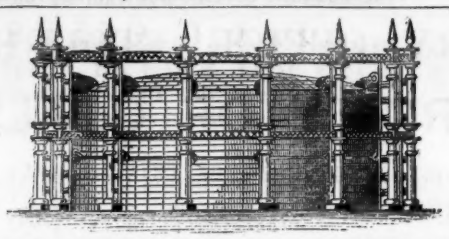

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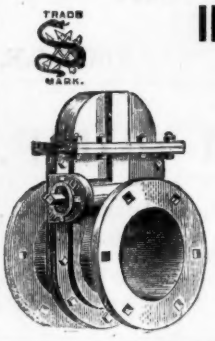

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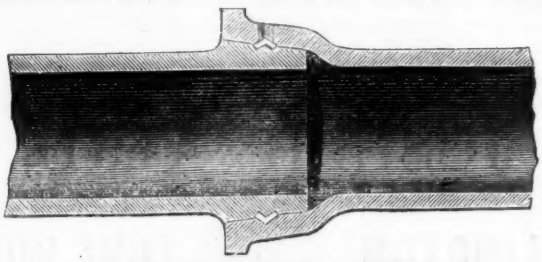

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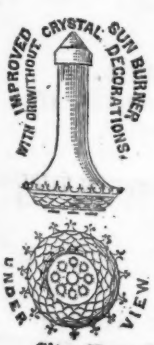

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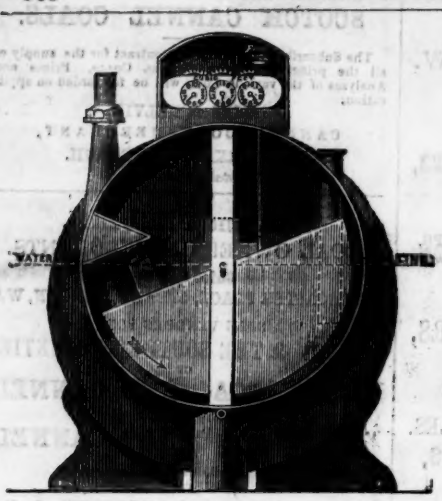

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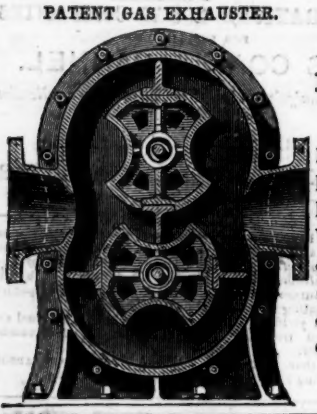

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